

U.S. 46/N.J. 3 CORRIDOR PLANNING STUDY GARDEN STATE PARKWAY TO NEW ROAD

Prepared for:

**STATE OF NEW JERSEY
DEPARTMENT OF TRANSPORTATION**

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I. CORRIDOR OVERVIEW

A. Study Background and Objective

Concerned by the existing traffic congestion in some areas and a potential for severe traffic problems in expected growth areas, the New Jersey Department of Transportation identified five travel corridors with the highest priority for transportation improvements. US 46/NJ 3 is one of the five study corridors.

The area for this study (Figure 1) was delineated by the western limit on US 46 at New Road and the two eastern limits of US 46 (Exit 154) and NJ 3 (Exit 153) at their respective Garden State Parkway interchanges.

In all, the study area affects 7 townships and boroughs in the three-county area comprised of Morris, Essex and Passaic counties. The original corridor study was initiated in 1986. This work consisted of a comprehensive compilation of data for the study area that included aerial photography, traffic counts, route inventories, accident statistics, land use and socioeconomic characteristics. Using this data base, a transportation model was developed and used in estimating 1996 and year 2006 travel demand and evaluating transportation facility deficiencies to determine needed corridor improvements. The study also included the participation of a 38 member Technical Advisory Committee representing both the private and public sector. This report describes recent activity undertaken to update previous study data and to determine an improvement program for the near term 1996 target year.

The corridor overview provides an understanding of the character and the dynamics of the US 46/NJ 3 area. The overview focuses on the transportation system of the study area to get a perspective of conditions as they exist now and as they may exist in the future. Based on that perspective of existing and future transportation conditions, the overview identifies the deficiencies in the transportation system. Those deficiencies will be the target for transportation improvements proposed by this study.

B. Regional Transportation System

1. New Jersey/New York Metropolitan Area -

One of the functions of the US 46/NJ 3 corridor area is to serve as one of the many arterials providing service to and from New York City. NJ 3 connects, via I-495,

LOCATION MAP

FIGURE 1





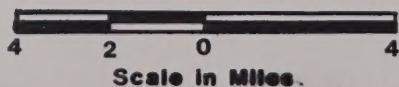
Source: Champion Map Corporation



STUDY CORRIDOR

LOCATION MAP

FIGURE 1



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with the Lincoln Tunnel, providing access to midtown Manhattan. Prior to the birth of the interstate system, the corridor was one of the few major routes to the city. Though it still serves that function, it also serves as access to dense commercial development, of which a great deal can directly access US 46, unlike today's interstate system, which has limited access. The section of US 46 between NJ 3 and the Garden State Parkway has numerous access points to roadside commercial land use and is primarily used as a link to north-bound Garden State Parkway travelers as well as its many commercial establishments.

2. Major Roadway Systems

The major roadway systems in the area include the following roads:

- . US 46 - an east-west principal arterial that varies from 4-7 lanes. It is heavily developed with numerous access points.
- . NJ 3 - an east-west urban principal arterial that has 4-6 lanes that serves as a direct link to the Meadowlands Sports Complex, the Lincoln Tunnel, I-95 and Midtown Manhattan.
- . I-80 - an east-west 6-8 lane median-divided limited access highway with grade separated interchanges at Hook Mountain Road, Fairfield Road, Vreeland Avenue, US 46/NJ 23 and Union Avenue in the immediate study area. It is a major trans New Jersey - Pennsylvania (and U.S.) highway which replaced US 46 as the major east-west corridor, but in the study area it provides access to/from I-287, the Garden State Parkway and I-95 (to the George Washington Bridge).
- . NJ 23 - a north-south principal arterial varying from 2-8 lanes, it bisects the US 46/NJ 3 study area in half. South of US 46, there are many at-grade intersections and it primarily serves local residential land uses. North of US 46, it is a multi-laned divided highway with grade-separated and at-grade interchanges also serving local traffic and is a connector to US 202. Immediately north of US 46, it has simultaneous designation as US 202 which intersects into the present terminus of I-287.
- . I-280 - an interstate facility beginning at I-80 near the western end of the study area and providing access to/from Newark and I-95 (NJ TPKE).

- . I-287 - an interstate facility which circumvents the study area to the west and north. Its current terminus is at US 202 but is under construction to be connected with I-287/I-87 at the NY State Thruway.
- . Garden State Parkway - the parkway is a north-south closed toll facility, traversing the entire length of the eastern border of New Jersey.
- . CO 506 (Bloomfield Avenue) - an east-west urban principal arterial varying from 2-4 lanes with on-street parking along most of its length. This route provides access to/from Newark and is characterized by its passing through numerous central business districts.

Minor arterials in the study area include US 202, Bloomfield Avenue, Passaic Avenue, Union Boulevard, Riverview Drive and Valley Road.

Collector Streets include Fairfield Road, Main Street (Little Falls) Clinton Road, Van Houten Avenue, Alps Road, Browertown Road, McBride Avenue, Rifle Camp Road, Horseneck Road, Lackawanna Avenue, Clove Road, New Road and Hook Mountain Road.

3. Public Transit

Public transit in the US 46/NJ 3 study area consists of a combination of bus and rail routes. Of these routes, there are three groups represented: rail lines, NJ Transit bus lines, and other bus lines. The "other" category is comprised of Community Transit Company Lines, DeCamp Bus Lines, Lakeland Bus Lines, Evergreen Trails, and Real Transit Bus Lines. The rail lines operating in the primary study area are run by New Jersey Transit. Other bus lines passing through the primary study area are Greyhound Lines, Inc., Martz Trailways and Trailways, Inc. These three bus lines utilize only I-80 and US 46 within the primary study area.

The majority of the bus routes utilize Interstate 80, US 46, NJ 23 and NJ 3. Bus routes on these major roadways are mainly express routes headed towards New York City, though local routes occur to the east of NJ 23 in the primary study area. Many have Willowbrook Mall in Wayne as their origin or destination.

The rail lines in the primary study area run from the northwest (along US 202) to the southeast (near Watchung Avenue), with numerous stops at local stations.

C. US 46/NJ 3 Corridor Regional Role

1. Transportation Function

US 46 is a principal east-west arterial that is heavily traveled and heavily developed. It serves traffic volumes between I-287, I-80, I-280, NJ 23 and the Garden State Parkway in the area. It has numerous access points, including over 200 in the study area alone. NJ 3 is also a principal east-west arterial but with limited access. It serves traffic volumes to and from US 46, NJ 21, NJ 17, I-95 (NJ TPKE), the Garden State Parkway and the Lincoln Tunnel (I-495).

One of the travel patterns that occurs in the western area involves the use of New Road between US 46 and I-280 for US 46 WB travel. This occurs because there are no ramps providing this movement at the US 46/I-80/I-280 interchange west of the study area. A proposed resource recovery plant on New Road will add heavy vehicles to the road, reducing the vehicle capacity of the roadway. Besides normal through and local traffic, US 46 allows vehicles to get to Bloomfield Avenue (NJ 159) which is a local alternate route to the Newark area. Also, Hook Mountain Road and Plymouth Street are two of the few local ways to get to the Montville area. System users also use Hook Mountain Road to access EB I-80.

The area of US 46 between the Clinton/Plymouth and US 46/NJ 23/I-80 interchanges primarily serves local traffic because of its dense commercial development immediately adjacent to US 46, on Fairfield Road and on Passaic Avenue. The largest attractor is at the Willowbrook Mall. It has 1,500,000 square feet of space and the adjacent smaller plaza at West Belt Mall has 651,000 square feet.

The heaviest movements at the US 46/NJ 23/I-80 interchange are between the north and eastern points; NJ 23 north, I-80 east and US 46 east. The state's motor vehicle inspection station is located within the interchange as well as several office complexes. System users use this interchange as an access route to New York City, via NJ 3. The most difficult geometric movements at this interchange include; 1) NJ 23 NB and SB through traffic; 2) US 46 WB through traffic; 3) I-80 WB to US 46 EB or WB; 4) NJ 23 NB to US 46 WB; 5) US 46 WB to I-80 EB; 6) US 46 EB to US 46 WB (U-turn); 7) US 46 WB to NJ 23 SB and; 8) NJ 23 SB to US 46 EB and; 9) US 46 WB to NJ 23 NB.

Some of these difficult geometric movements also have some of the greatest traffic volumes. The movement that has the greatest ramp traffic volume is the US 46 WB to NJ 23 NB or I-80 WB. There are also no less than four merge or diverge situations that a driver has to go through to get to NJ 23 NB or I-80 WB from US 46 WB. The least difficult movements are the I-80 EB to US 46 EB and I-80 EB and WB through movements, though the I-80 EB to US 46 EB movement still has to merge with NJ 23 SB to US 46 EB through traffic and US 46 EB traffic.

East of the US 46/NJ 23/I-80 Interchange, US 46 serves through traffic to/from New York City. It also serves high developed commercial areas on US 46 and development located off of US 46 on Riverview Drive, Union Boulevard, etc. It also serves local access to Lackawana Avenue that parallels US 46 in the north side and Main Street that parallels US 46 on the south side. It also serves development that is not readily accessible from I-80. This includes traffic from areas served by NJ 23 on the north side of I-80/US 46.

The US 46/NJ 3 interchange is used by vehicles to and from New York City via NJ 3. Access to Valley Road provides arterial service to local points north (Paterson) and south (Montclair). There is no direct interaction between US 46 WB to NJ 3 EB or vice-versa. Grove Street or Valley Road is utilized for this movement, if desired. Unlike its current configuration, US 46 to NJ 3 is the predominant movement through the interchange.

NJ 3 is used by vehicles traveling to and from New York City, the Garden State Parkway (south) and the New Jersey Turnpike. The US 46 section provides access to the Garden State Parkway (north) and eventually leads eastward to the George Washington Bridge. It serves a great deal of local movement as there is commercial development along its route.

2. Economic Development

The US 46/NJ 3 study area will grow at a moderate rate over the next twenty years, continuing the trend established from 1980-1986.

The corridor is in the initial stages of a transition from mainly retail and personal services to regional offices of major corporations. Employment trends in the area also indicate a shift from manufacturing to more service-oriented employment. Figure 2 shows the current development.



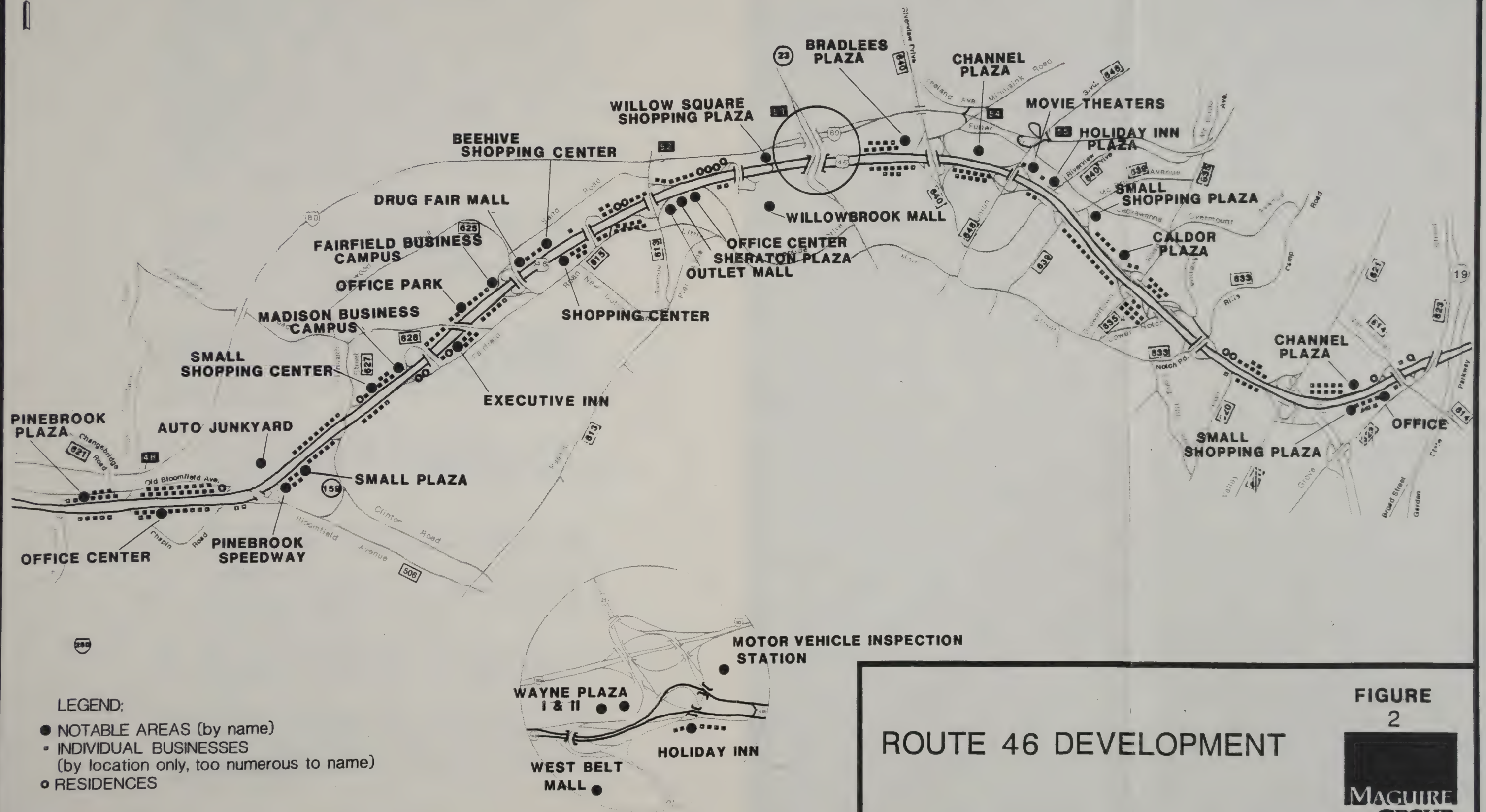
LEGEND:

- NOTABLE AREAS (by name)
- INDIVIDUAL BUSINESSES
(by location only, too numerous to map)
- RESIDENCES

DEVELOPMENT

FIGURE
2





The impact of the changing nature of development in the study area can be seen in the recently developed projects. While warehouses, strip retail, and 2-3 story office buildings are still being developed, the area is also seeing high-rise office buildings and hotels. This denser development is due to a combination of scarce land and rising land costs, but also due to the market demand for higher quality buildings. Over time, many of the low-density retail, office, and industrial/warehouse uses in the Corridor will be converted to more intense uses, particularly offices and hotels. In the residential sector, low vacancy rates (estimated at 2.5%) and high land costs have led to more townhouse developments.

The municipalities in the area, by and large, support new development in the appropriate land use zones. Most of the opposition to development arises in areas where there are flood zones. Most municipalities in the area favor redevelopment where older out of date uses are no longer appropriate.

Specific assumptions and details can be found in Technical Memorandum Task 3 - Corridor Development Potentials, November 5, 1986, prepared by Halcyon, Ltd. The following conclusions were made about the immediate study area, consisting of municipalities within 3 miles of the corridor:

1. The number of households is projected to increase from 3 to 33 percent between 1986 and 2006, depending on location. By contrast, the number of households increased by 4 percent between 1980 and 1986.
2. The number of dwelling units is projected to grow between 14 and 27 percent between 1986 and 2006.
3. Growth in retail employment between 1986 and 2006 is projected to be 8 to 35 percent, which is considerably less than what is projected on a more regional basis (25 to 59 percent).
4. Non-retail employment will grow more rapidly than population or households. It is projected to grow between 29 and 50 percent between 1986 and 2006.

Modifications were made to the original traffic volume predictions in 1989 based on the actual development during the three-year period from the original Corridor Development Potentials. The following per anum increases were made:

1. The New Road and Hook Mountain Road interchanges in the western end of the study area are predicted to have the greatest traffic volume increases from potential development at 2.5% and 2.3% per year, respectively.
2. The Riverview Drive interchange area is predicted to incur 1.0% per year traffic volume increases from potential development. The actual volume is almost as significant as the western end since the 1% growth is calculated with large traffic volume numbers.
3. The McBride, Browertown and Lower Notch interchanges with US 46 are predicted to have annual traffic volume increases from development of 0.2%.

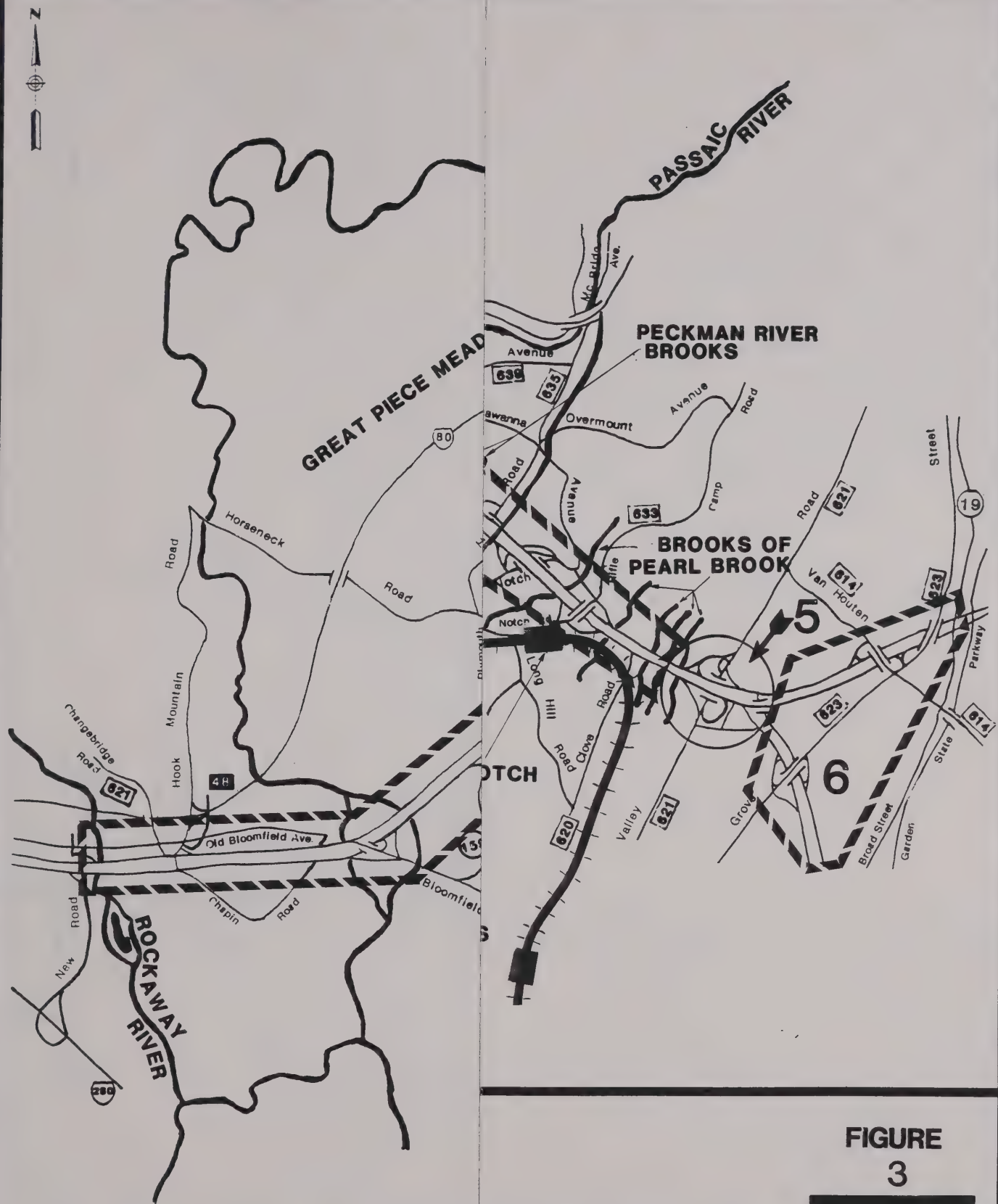
II. IDENTIFICATION OF CORRIDOR PROBLEMS BY FUNCTIONAL AREA

A. INTRODUCTION

The study area of the corridor includes a very old roadway dating back prior to the interstate system. There are six areas or segments in the study area that will be addressed. The areas are identified by the physical characteristics of the roadway, the type of users and by deficiencies unique to its area. They are shown below and in Figure 3.

- 1) The area of US 46 from New Road to Clinton/Plymouth; the area of signalized intersections.
- 2) The area of US 46 between Clinton/Plymouth and the US 46/NJ 23/I-80 interchange.
- 3) The US 46/NJ 23/I-80 interchange.
- 4) The area of US 46 east of the US 46/NJ 23/I-80 interchange to NJ 3.
- 5) The US 46/NJ 3 interchange.
- 6) The area of US 46 between NJ 3 and the Garden State Parkway and; NJ 3 between US 46 and the Garden State Parkway.

The 1989 Average Daily Traffic (ADT) volumes are shown in Figure 4. The existing counts were developed from automatic traffic recorder counts taken during the 1985-89 period. Count sources include the NJDOT, local counts, local studies and collected counts from the 1986 study. Turning movement counts were also collected or developed at all the US 46/NJ 3 cross-street and ramp intersections during the AM and PM peak periods.

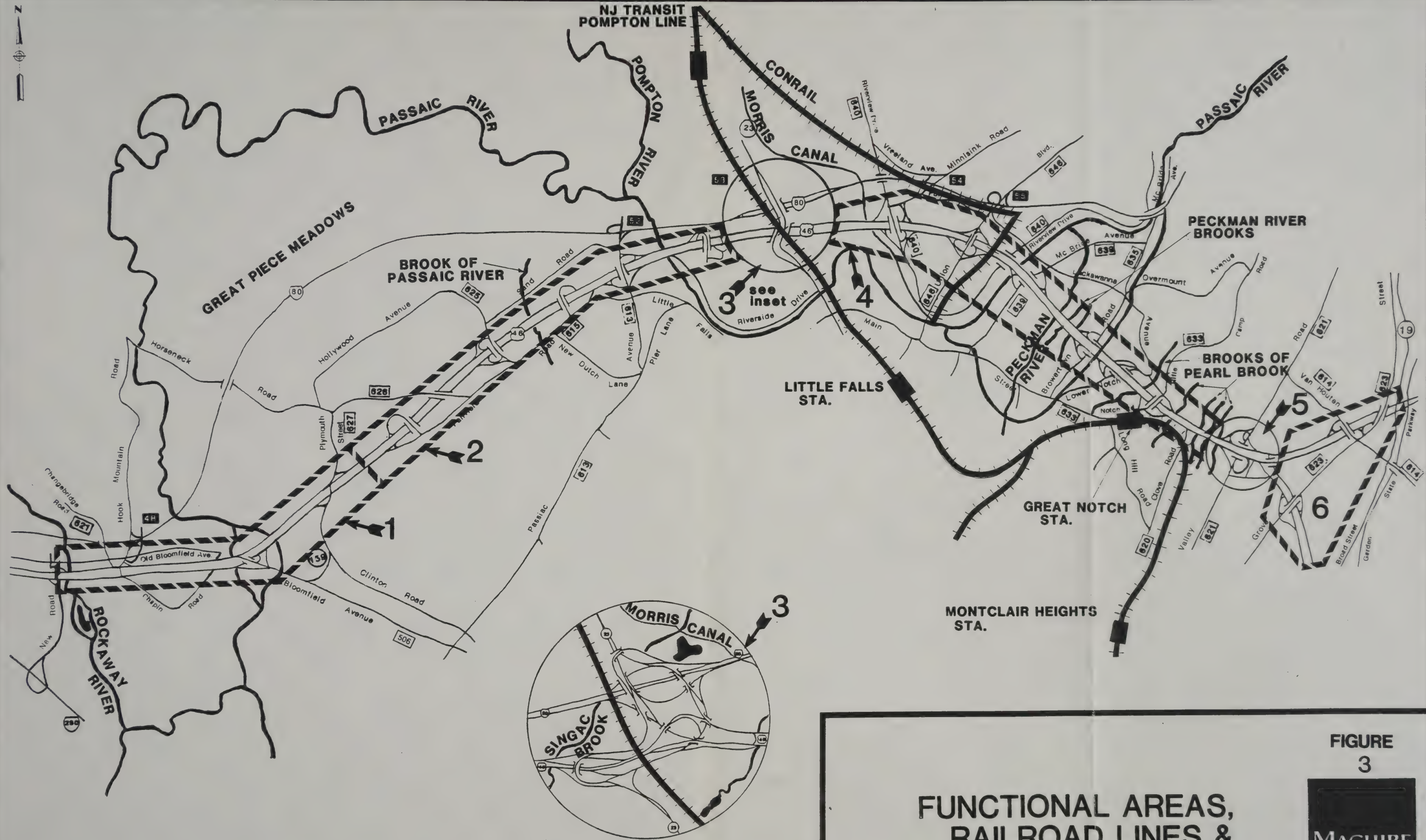


Schematic Not to scale

L AREAS,
D LINES &
COURSES

FIGURE
3



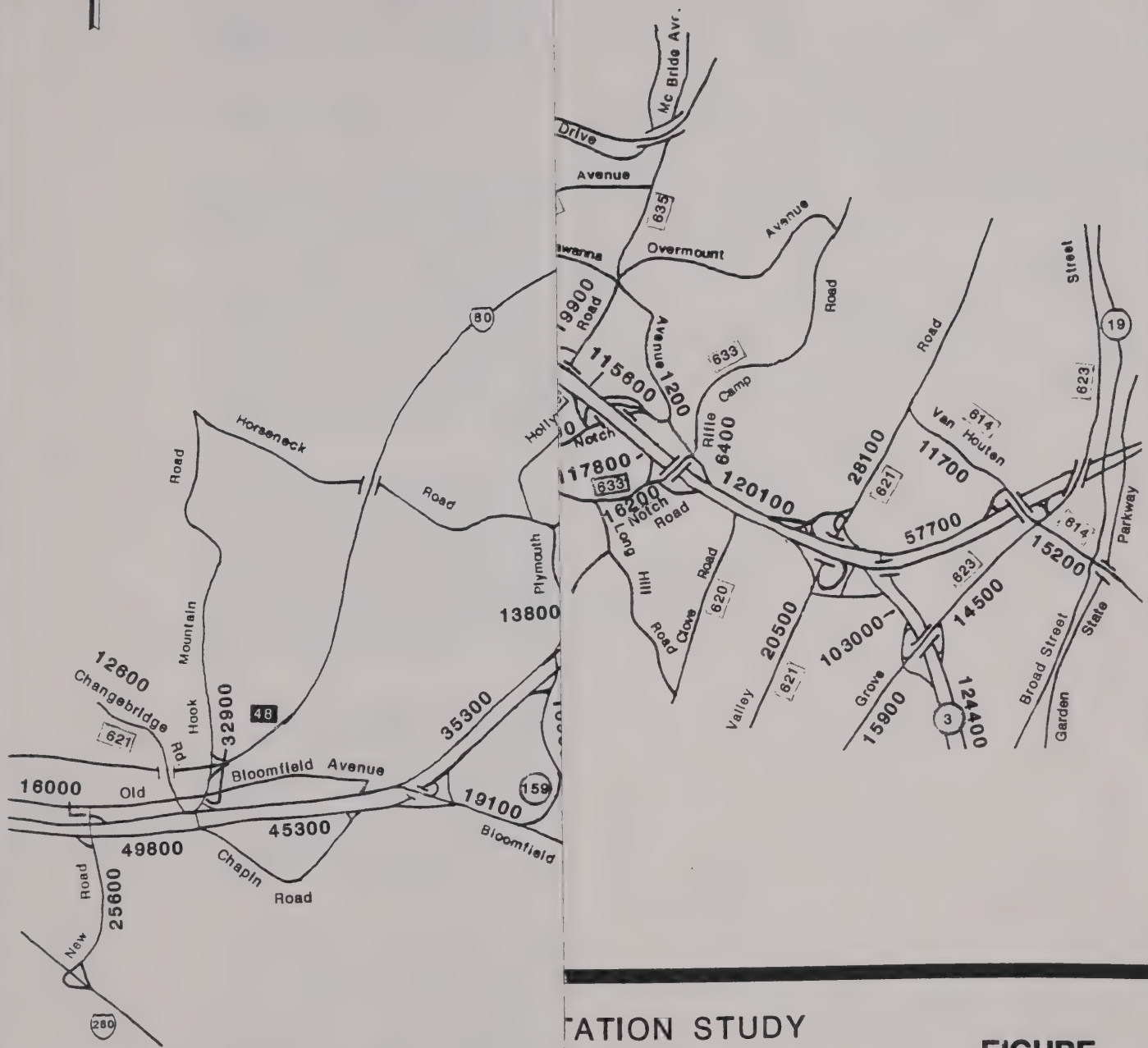


Schematic Not to scale

**FIGURE
3**

**FUNCTIONAL AREAS,
RAILROAD LINES &
WATERCOURSES**

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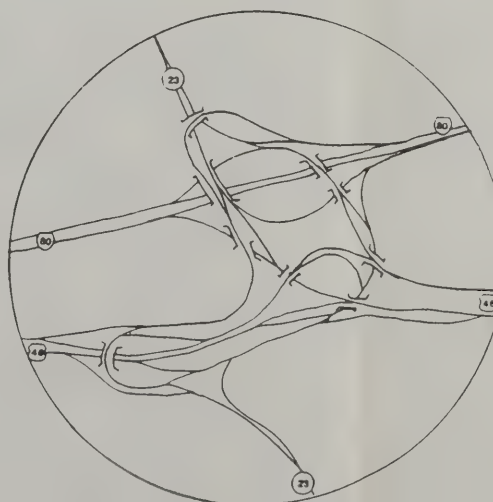
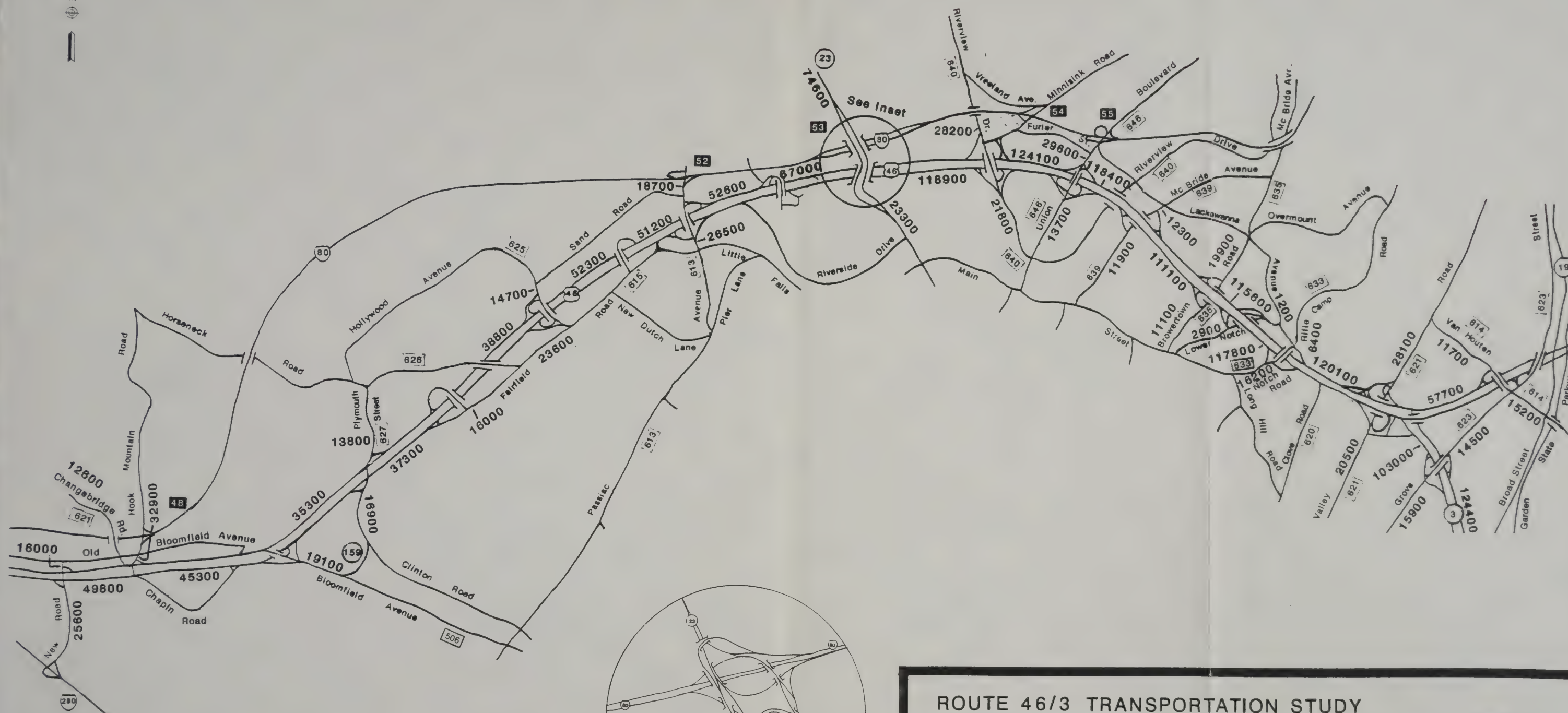


TATION STUDY

FIGURE
4

- Interstate
- U.S. Route
- State Highway
- County Road





Schematic not to scale

ROUTE 46/3 TRANSPORTATION STUDY

1989 ADT

FIGURE

4



Future traffic volumes were developed from the projections of population and employment prepared by Halcyon Ltd. and from NJDOT growth rates. These are unconstrained volumes that were adjusted by the current count program and current development. The estimated 1996 ADT volumes are shown in Figure 5. The AM and PM peak hour volumes for the years 1989 and 1996 are presented in Technical Memorandum #2.

B. IDENTIFICATION

The identification of problems discussed e.g., LOS, V/C, geometrics, accidents, growth, etc. are representative of both the existing (1989) and near-future (1996) scenarios. The seven-year difference in study years shows that all but one of the intersections/interchanges that are currently non-deficient are predicted to remain that way in the 1996 scenario. There are some changes in the levels-of-service but they are minor and do not put the intersections/interchanges in a deficient situation. There are only minor changes because of the current network saturation and the predicted low growth rate.

The intersections/interchanges that are currently deficient will still be deficient in the 1996 scenario. There are also some intersections which have programmed improvements, e.g., US 46 and Hook Mountain Road/Chapin Road and the Riverview Drive interchange area. The only intersection/interchange that is currently non-deficient and is predicted to be deficient in 1996 is the Hook Mountain Road/Chapin Road intersection.

In the following identification of problems, the term of level-of-service, or LOS is used. It is a qualitative measure describing operational conditions and their perception by motorists. A level-of-service definition describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort, convenience and safety.

Six levels of service are defined with letter designations from A to F with LOS A representing the best condition and LOS F representing the worst. LOS A,B,C and D are considered acceptable conditions and LOS E and F are considered deficient. The qualitative and perceptual differences between the LOS designations for arterial segments and intersections are shown below:

LOS

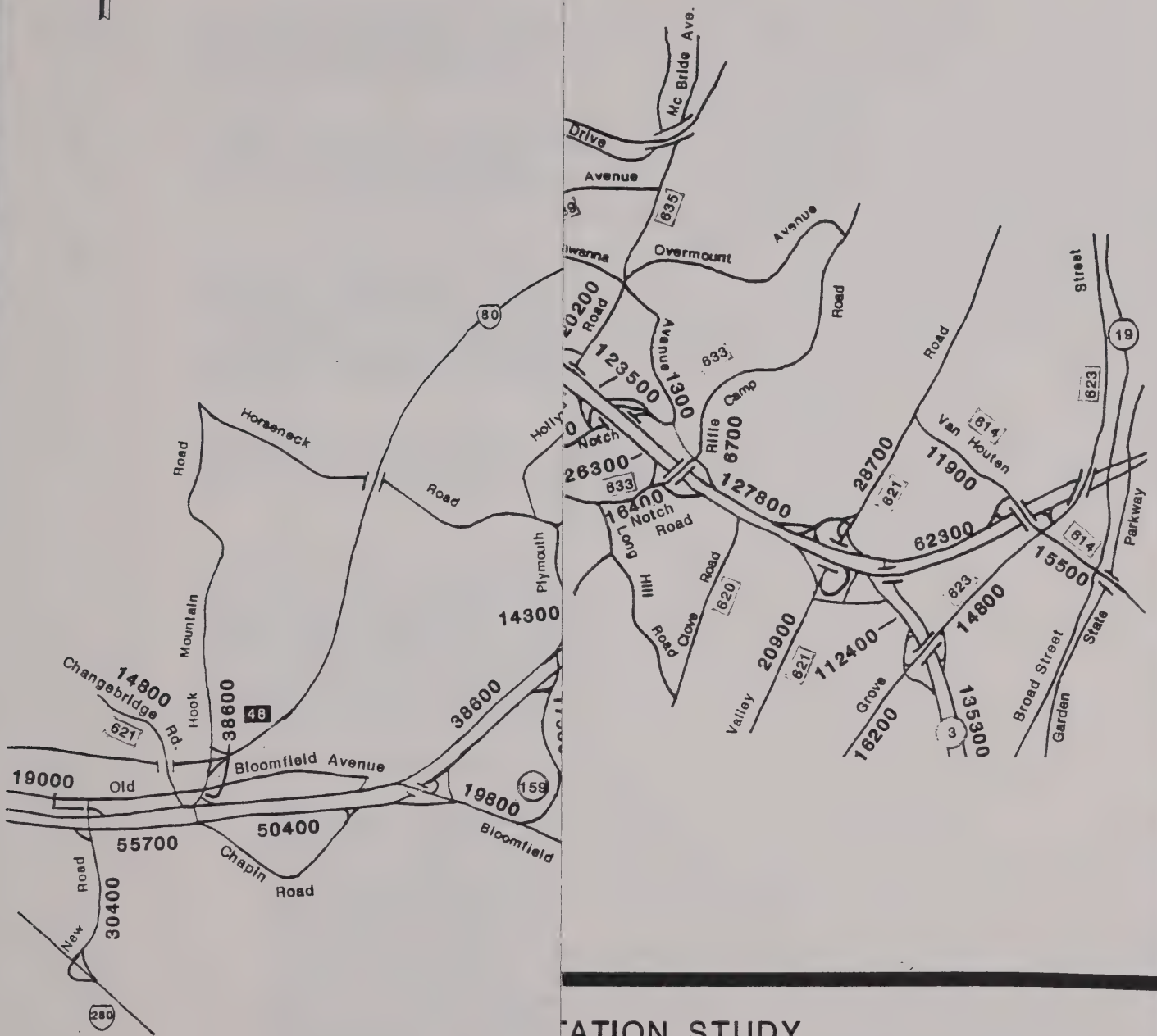
ARTERIAL





INTERSECTION

A

Free flow, high maneuverability, excellent conditions.

Average delay of less than 5 seconds per vehicle, most vehicles rarely stop.



-  Interstate
-  U.S. Route
-  State Highway
-  County Road

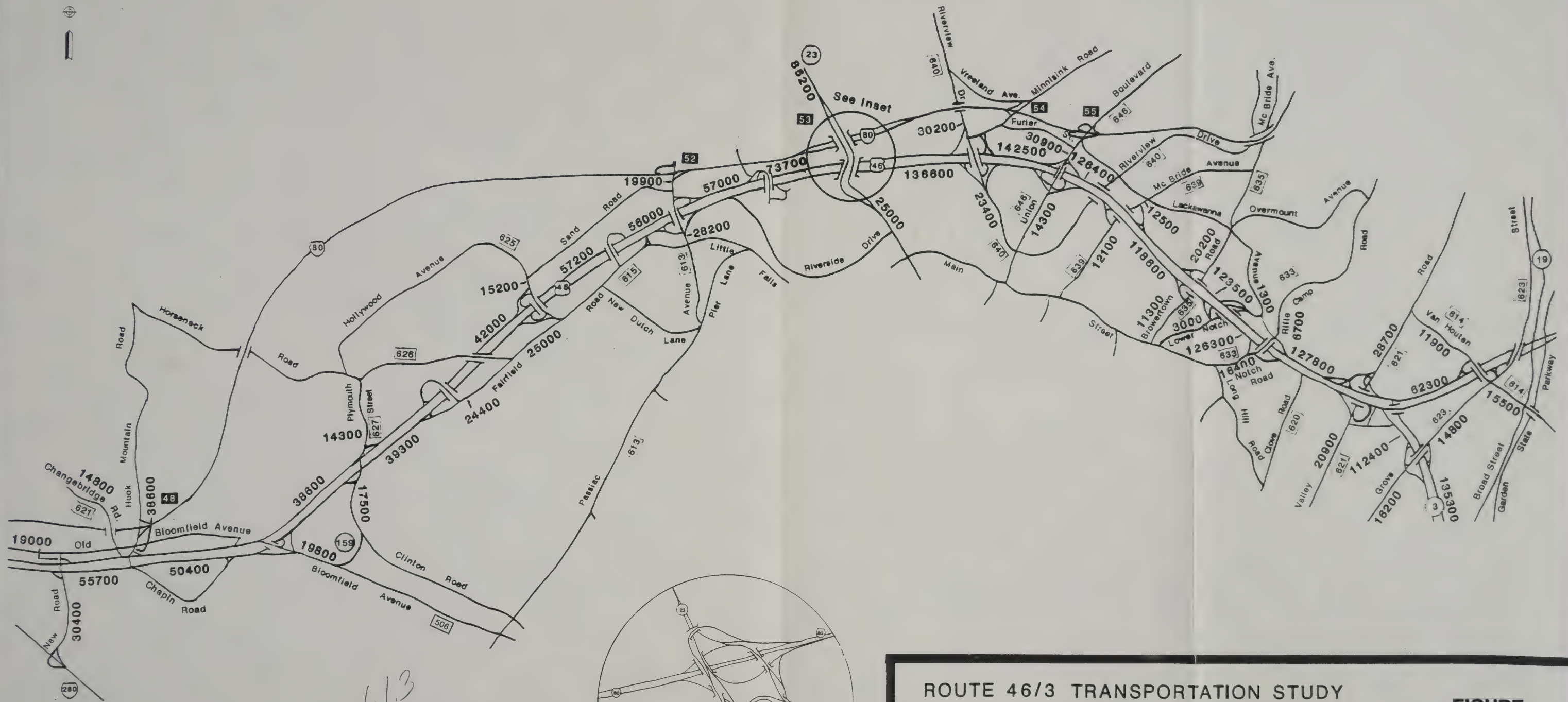
ATION STUDY

T

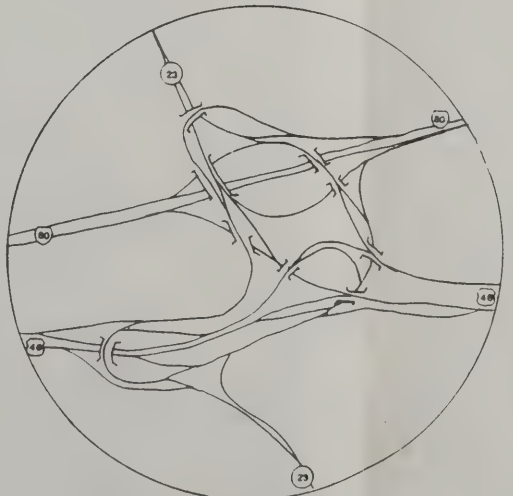
FIGURE

5





MP 51.0 - 61.3



Schematic not to scale

ROUTE 46/3 TRANSPORTATION STUDY

1996 ADT

FIGURE

5



- Interstate
- U.S. Route
- State Highway
- County Road

B	Stable flow, similar conditions to LOS A but slightly lessened.	Average delay of 5-15 seconds, good progression similar to LOS A but slightly less.
C	Average condition, presence of other motorists affects all factors.	Average delay of 15-25 seconds, fair progression, average condition.
D	High density but stable flow, small increases in traffic can cause operational problems.	Average delay of 25-40 seconds, influence of congestion becomes more noticeable.
E	Operating conditions at or near capacity, speeds are low but uniform, small increases in traffic flow can cause breakdown and driver frustration is high.	Average delay of 40-60 seconds, considered to be the limit of acceptable delay.
F	Breakdown of flow, queues form, stop and go waves occur.	Delay is greater than 60 seconds, unacceptable situation, oversaturation with poor progression.

Accident data was reviewed for the year 1987 along the entire U.S. 46 corridor study area. Locations that experienced higher numbers of accidents for the year are noted in the discussion of the intersection, as well as some of the primary reasons for the accidents (i.e., left turns, weaving, head-on, stationary objects, etc.).

1. Area 1 - New Road to Clinton/Plymouth Street

The area of US 46 between New Road and Clinton/Plymouth Streets is comprised of a 4-lane roadway with shoulders and 3 at-grade signalized intersections with jug-handle turns and permitted U-turn movements. It also includes a grade-separated interchange at Bloomfield Avenue where the westbound direction of US 46 merges into a single lane east of the interchange. The single lanes from Bloomfield Avenue and US 46 form two lanes in the WB direction on US 46. West of the Bloomfield Avenue interchange, the peak traffic flow direction is to the east in the AM condition and west in the PM.

US 46 at New Road - Current ADT volumes are 49,800 on US 46; 25,600 on New Road south of US 46 and; 16,000 on New Road north of US 46. Estimated 1996 volumes are 55,700, 30,400 and 19,000, respectively. The intersection does not have a deficient LOS, despite the long

queues on US 46 but, the 1989 PM level-of-service for the NB direction is 'E'. The V/C ratios for the 1989 PM condition are 1.041 and 1.010 for the WB through and NB left turn movements, respectively. The 1996 PM level-of-service for the WB and NB directions is 'E', but the overall intersection LOS is 'D'. These V/C ratios are predicted to be 1.101 and 1.021 for the WB through and NB left turn movements, respectively, in the 1996 PM conditions.

Problems occur, however, at the jug-handle intersection with New Road on the north side. The westbound US 46 left-turns and U-turns conflict with the southbound approach on New Road at the jug-handle intersection with New Road. Current/Future LOS is "E/F" at this intersection with a volume/capacity ratio greater than 1.0. However, the Highway Capacity Manual does not take into account the queue from the southbound vehicles at the US 46/New Road intersection. This southbound queue also spills back into the intersection of New Road and Old Bloomfield Avenue. (See Figure 6). Therefore, the LOS is actually worse than "E" in the current scenario.

The New Road intersection was analyzed with a reverse jug-handle in the NW quadrant to provide better WB to SB flow (See Figure 7). This improvement would also be coupled with the restricting of vehicle access from Old Bloomfield Avenue and making the intersection as a two-phase signal. Access will still be permitted to Old Bloomfield Avenue. This analysis proved to be worthwhile as the New Road NB and SB approaches were improved to acceptable levels-of-service. Property would have to be acquired in the NW quadrant. The addition of a third through lane is also recommended between New Road and Bloomfield Avenue and is discussed in the arterial section.

US 46 at Hook Mountain/Chapin Roads - Current ADT volumes are 49,800 on US 46 west of the intersection; 45,300 on US 46 east of the intersection and 32,900 on Hook Mountain Road. Estimated 1996 volumes are 55,700, 50,400, and 38,600, respectively. The LOS is currently deficient with long queues at the northbound and southbound approaches to this intersection (See Figure 8). A current proposal to construct a reverse jug-handle in the southeast quadrant was modeled. It improved the LOS somewhat, but not to an acceptable level. In order to adequately improve the intersection, we eliminated one of the two left-turn lanes in the exclusive U-turn and created two left-turn lanes for the southbound direction approach on Hook Mountain Road. The remaining single left-turn lane at the U-turn has a storage length of 95 feet to the end of the U-turn curve and a total length of 262 feet back to

Schematic not to scale

OLD BLOOMFIELD AVENUE

LONG
QUEUES

← OLD BLOOMFIELD AVENUE
LOCATED TOO CLOSE TO
RT. 46 / NEW ROAD
INTERSECTION

LONG QUEUES
BECAUSE OF
DIFFICULT LT
MOVEMENT

← QUEUE IS
CONTROLLED BY
RT. 46 WB
QUEUE

ROUTE 46

NEW ROAD

LONG WB
QUEUES PREVENT
VEHICLES FROM
ACCESSING
THE JUG-HANDLE

TRAFFIC FLOWS
COME IN WAVES
FROM HOOK
MOUNTAIN / CHAPIN
INTERSECTION
WITH ROUTE 46.



EXISTING
PROBLEMS



FIGURE
6

ELIMINATE BUILDING OLD BLOOMFIELD AVENUE

* CURVE
RADI SHOWN
ARE
MINIMUMS

DROP THIRD
THROUGH LANE

150' RADIUS
ACCEL LANE

75' RADIUS*
150' RADIUS*
100' TANGENT
— create loop
ramps
150' RADIUS*
50' TANGENT

close down access from
Old Bloomfield Ave

RIGHT TURN ONLY
to Old Bloomfield
Ave

ADD THIRD
THROUGH LANE

LOOP DECEL LANE

ROUTE 46

BEGIN THIRD THROUGH
LANE

ADD THIRD THROUGH LANE

NEW ROAD



PROPOSED
SOLUTIONS



FIGURE
7

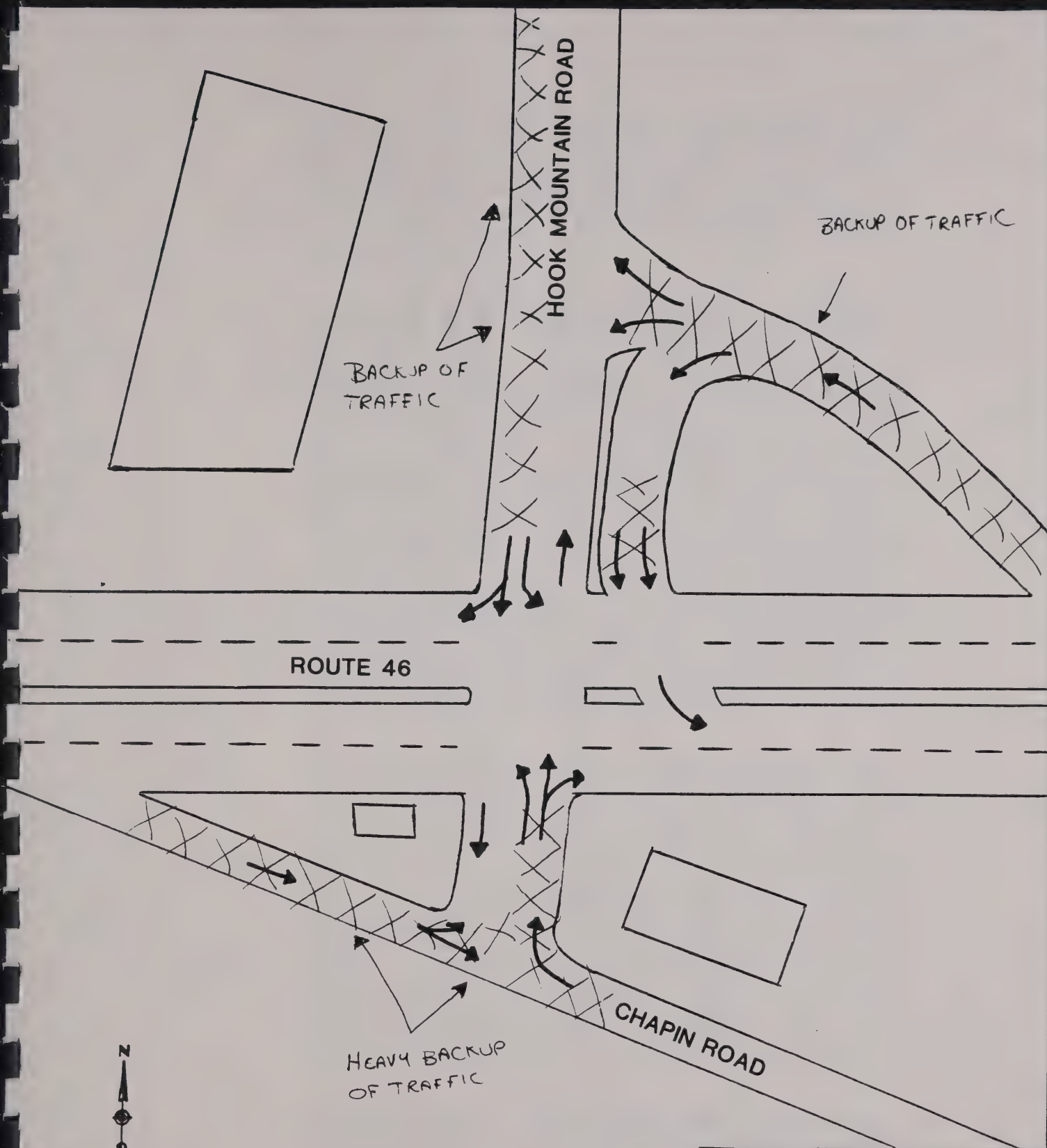
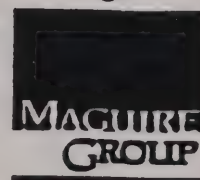


FIGURE
8

EXISTING
PROBLEMS

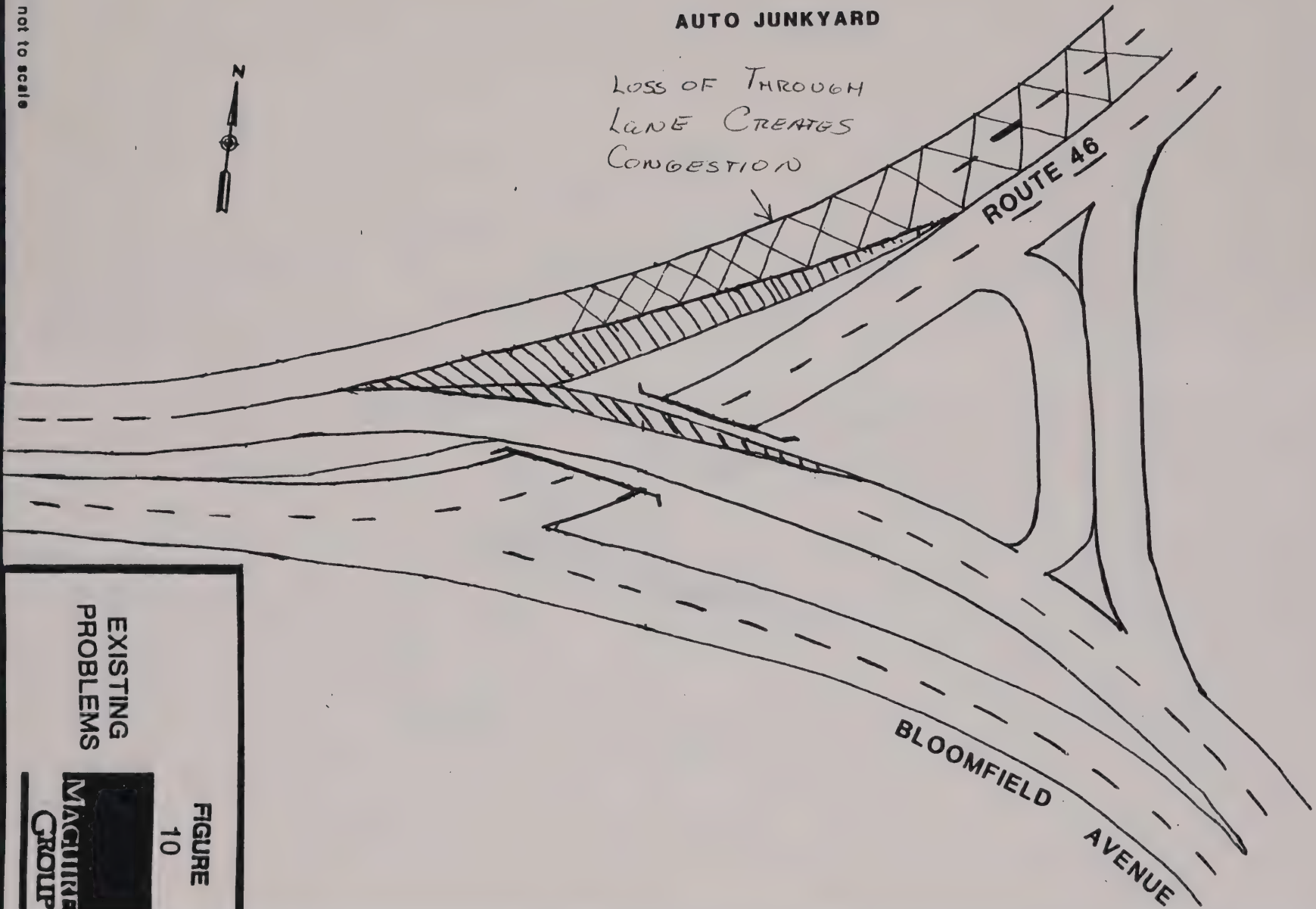


Route 46. The single U-turn lane can adequately handle the U-turn volumes with a slight modification to the ramp from US 46 to Hook Mountain Road so the left-turns and U-turns can be funneled properly (See Figure 9). The addition of a third through lane at this intersection is also recommended and is discussed in the arterial section.

US 46 at Bloomfield Avenue interchange - Current ADT volumes for US 46 are 45,300 west of the interchange and 35,300 east of the interchange and Bloomfield Avenue has 19,100. Estimated 1996 volumes are 50,400, 38,600 and 19,800, respectively. The westbound direction of US 46 is constrained by the loss of a through lane (See Figure 10). It was formerly striped as two lanes, but there was a merge deficiency with the Bloomfield Avenue traffic and one through lane was converted to alleviate this merge deficiency. Several alternatives were looked at to relieve the through traffic constraint; 1) Adding a merge lane west of the interchange in the median, restriping the westbound direction to two through lanes and creating an at-grade intersection (See Figure 11); 2) Construct an intersection similar to that at New Road or Hook Mountain/Chapin Roads with a jug-handle (See Figure 12) and; 3). Reconstructing the westbound direction to two lanes in conjunction with a third through lane addition west of the interchange (See Figure 13).

The first alternative (Fig. 11) constrains the Bloomfield Avenue approach traffic from two lanes to one lane at the approach to the signal. This merge would create unsatisfactory traffic operations at this intersection and it also stops US 46 EB traffic so this volume can cross over at-grade. The second alternative (Fig. 12) may have environmental constraints involving the auto junkyard and the Passaic River (Please refer to Figure 3). It also stops both directions of US 46 traffic. Therefore, the third alternative (Fig. 13) is the best solution as it does not constrain WB through traffic and works in conjunction with the third lane addition on US 46 west of the interchange. The discussion of the third lane is discussed in the arterial section.

A capacity analysis was not performed for the jug-handle alternative, since this would require a more detailed analysis of traffic diversion from Clinton Road and the potential LOS impacts at other intersections. Since this movement can be accomplished at Clinton/Plymouth and Hook Mountain Road interchanges, and because of the constraints involved in building this movement, this solution is not recommended. The proposed geometrics were based on existing and estimated traffic movements.



EXISTING
PROBLEMS

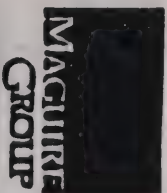


FIGURE
10

AUTO JUNKYARD



ADD THIRD LANE FOR
BLOOMFIELD AVE TO
ROUTE 46 WB

RESTRIPE TO TWO THRU LANES

ROUTE 46

STOP BAR

ADD THIRD LANE
STOP BAR
ELIMINATE
BRIDGE

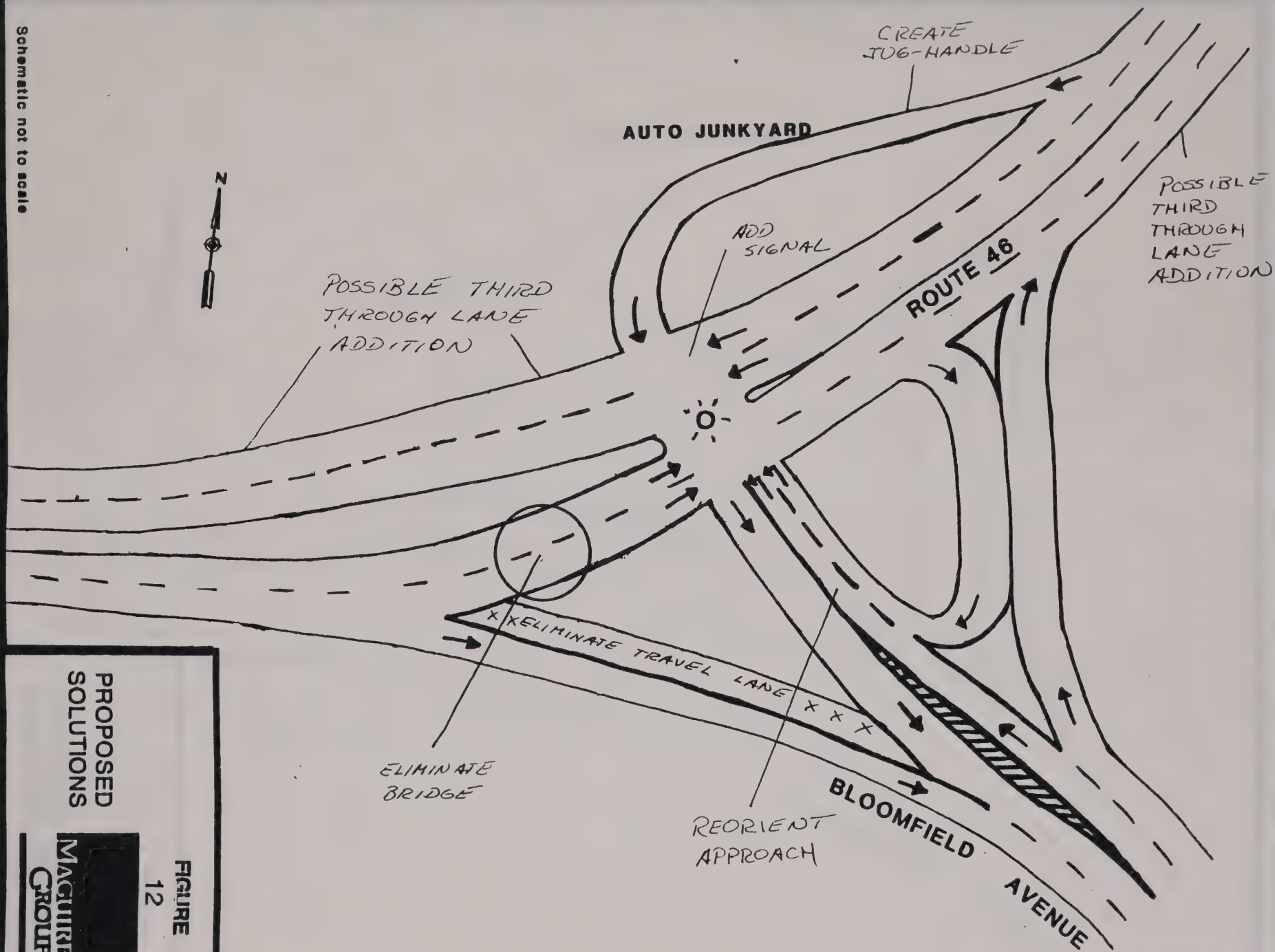
NEW SIGNAL

BLOOMFIELD
AVENUE

PROPOSED
SOLUTIONS

MAGUIRE
GROUP

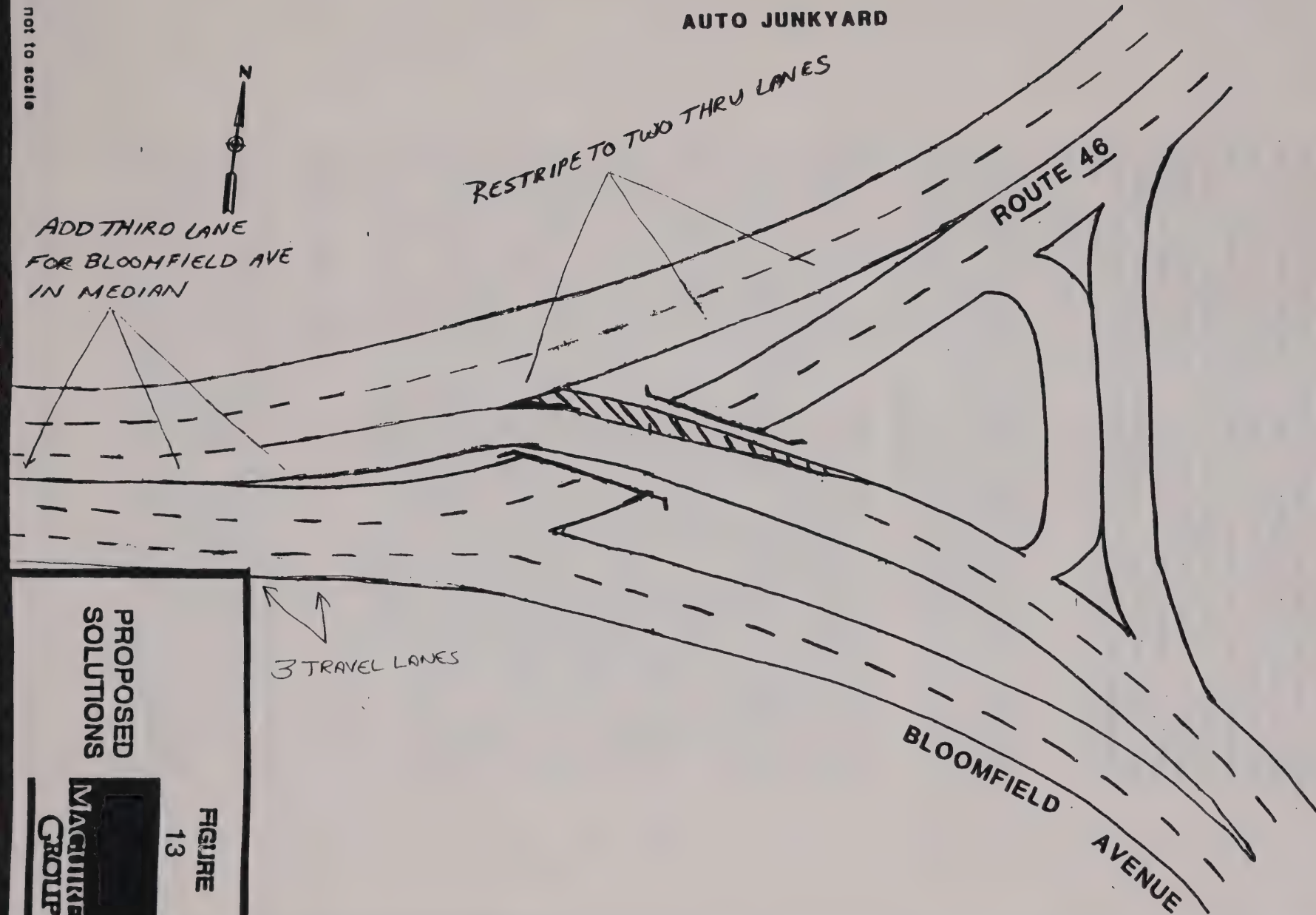
FIGURE
11



PROPOSED
SOLUTIONS



FIGURE
12



PROPOSED
SOLUTIONS

MACQUIRE
GROUP

FIGURE
13

US 46 at Clinton/Plymouth Streets - Current ADT volumes are 35,300 on US 46 west of the intersection and 37,300 east of the intersection. Plymouth Street has an ADT of 13,800 and Clinton Road has 16,900. Estimated 1996 ADT volumes are 38,600 on US 46 west of the intersection and 39,300 east of the intersection. Plymouth Street is estimated to have an ADT volume of 14,300 and Clinton Road, 17,500. There are long queues at this intersection in all directions (See Figure 14). The north side of this intersection is confusing because of the numerous islands and lack of adequate directional lane markings.

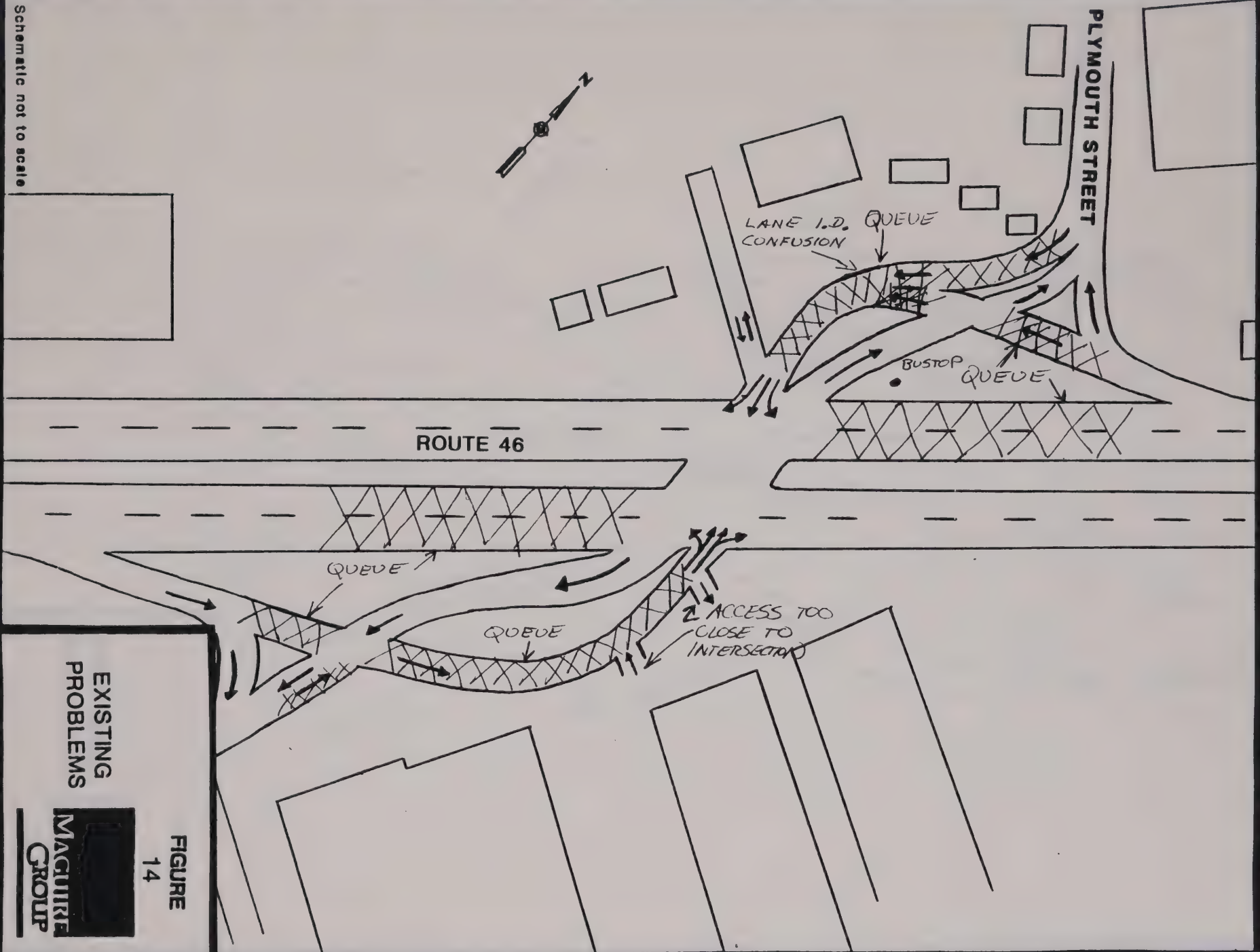
These cross-streets were analyzed as two separate intersections approximately 1200 feet apart (See Figure 15). The splitting and resignalization of the intersection improved the level-of-service of this area to an acceptable LOS "C". Property would have to be acquired for this improvement.

The arterial section between New Road and Bloomfield Avenue requires an additional through lane that can be added in the median. In the westbound direction, it can be an add-a-lane scenario from the Bloomfield Avenue on-ramp to US 46 and in the eastbound direction it can be dropped at the US 46 off ramp to Bloomfield Avenue (Please refer to Figure 13). This was originally estimated to cost \$2,000,000 in 1987. While improving the LOS on the mainline, this add-a-lane scenario will also help provide the continuity needed on Route 46 westbound at the Bloomfield Avenue interchange. A secondary impact of this improvement is to improve the intersection LOS at US 46 and New Road and the US 46 and Hook Mountain Road intersections. More green time can be given to the minor approaches from the mainline because the mainline's capacity is increased. The improvement of the New Road and Hook Mountain Road interchanges should be undertaken at the same time as the addition of the third through lane on U.S. 46. This is the most effective and efficient way of easing traffic movements in the long-term.

2. Area 2 - Clinton/Plymouth (NJ 159) to the US 46/NJ 23/I-80 Interchange

This section is typical of other studied sections to the east because it has grade-separated interchanges as well as several at-grade ingress/egress points. However, its traffic flow characteristics are not indicative of the major through flow from I-80 and NJ 23 to NJ 3 (New York City) via US 46. It carries traffic between I-280 and NJ 23 because of the lack of

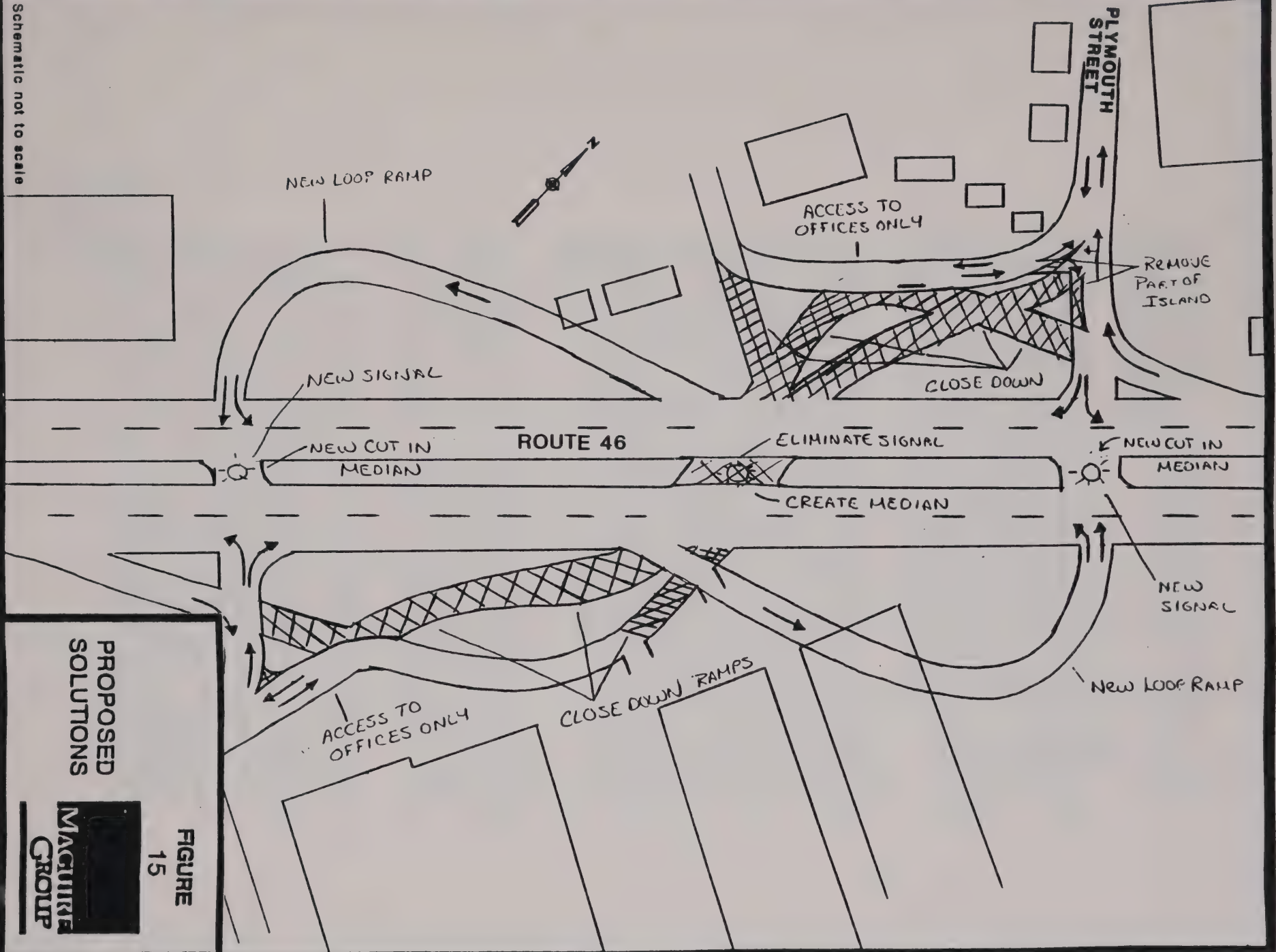
Schematic not to scale



EXISTING
PROBLEMS

MACQUIRE
GROUP

FIGURE
14



PROPOSED
SOLUTIONS

MAGUIRE
GROUP

FIGURE
15

an interchange for this movement at I-280/I-80. It also carries traffic to Fairfield Road, which is well developed and parallels US 46 between Plymouth Street and Passaic Avenue.

The area between the Clinton/Plymouth intersection and the US 46/NJ 23/I-80 interchange is a 4-lane arterial with shoulder and has grade-separated interchanges located at Fairfield Road, Hollywood Avenue, Passaic/Fairfield Avenue and Willowbrook Mall. There are also some unsignalized at-grade "T" intersections. Its peak hour flow is reverse of the peak hour flows in the rest of the study area. This segment's predominant flow is westbound in the AM and eastbound in the PM.

US 46 at Hollywood Avenue Interchange - Current ADT volumes on US 46 west of the interchange is 38,800 and east of the interchange 52,300. Hollywood Avenue carries 14,700 vpd north of the interchange and 15,700 vpd south of the interchange to Fairfield Road. Estimated 1996 volumes on US 46 are 42,000 west of the interchange and 57,200 east of the interchange. Estimated 1996 volumes on Hollywood Avenue are 15,200 north of the interchange and 16,200 south of the interchange. Both ramp intersection termini accommodate a high traffic volume. However, both the existing (1989) and the projected (1996) level of service were shown to be satisfactory, both during the AM and PM peak hours. Therefore, no improvements are recommended.

In addition, it is important to note these unsignalized intersections are characterized by poor turning radii and triangle islands that split the ramps traffic (See Figure 16). The islands create merge/diverge and crossovers on the ramps. No modifications are necessary at this time, however, traffic operations at this intersection should be monitored periodically.

US 46 at Passaic Avenue/Two Bridges Road Interchange - Current ADT volumes on US 46 are 51,200 west of the interchange and 52,600 east of the interchange. Passaic Avenue carries 26,500 vpd and Two Bridges Road carries an estimated 18,700 vpd. Estimated 1996 ADT volumes on US 46 are 56,000 and 57,000 west and east of the interchange, respectively. Passaic Avenue ADT is estimated to increase to 28,200 and Two Bridges Road ADT is estimated to increase to 19,900. Both ramps termini have deficient LOS. The US 46 eastbound off-ramp traffic onto Passaic Avenue has queues that develop because the northbound left turns have a

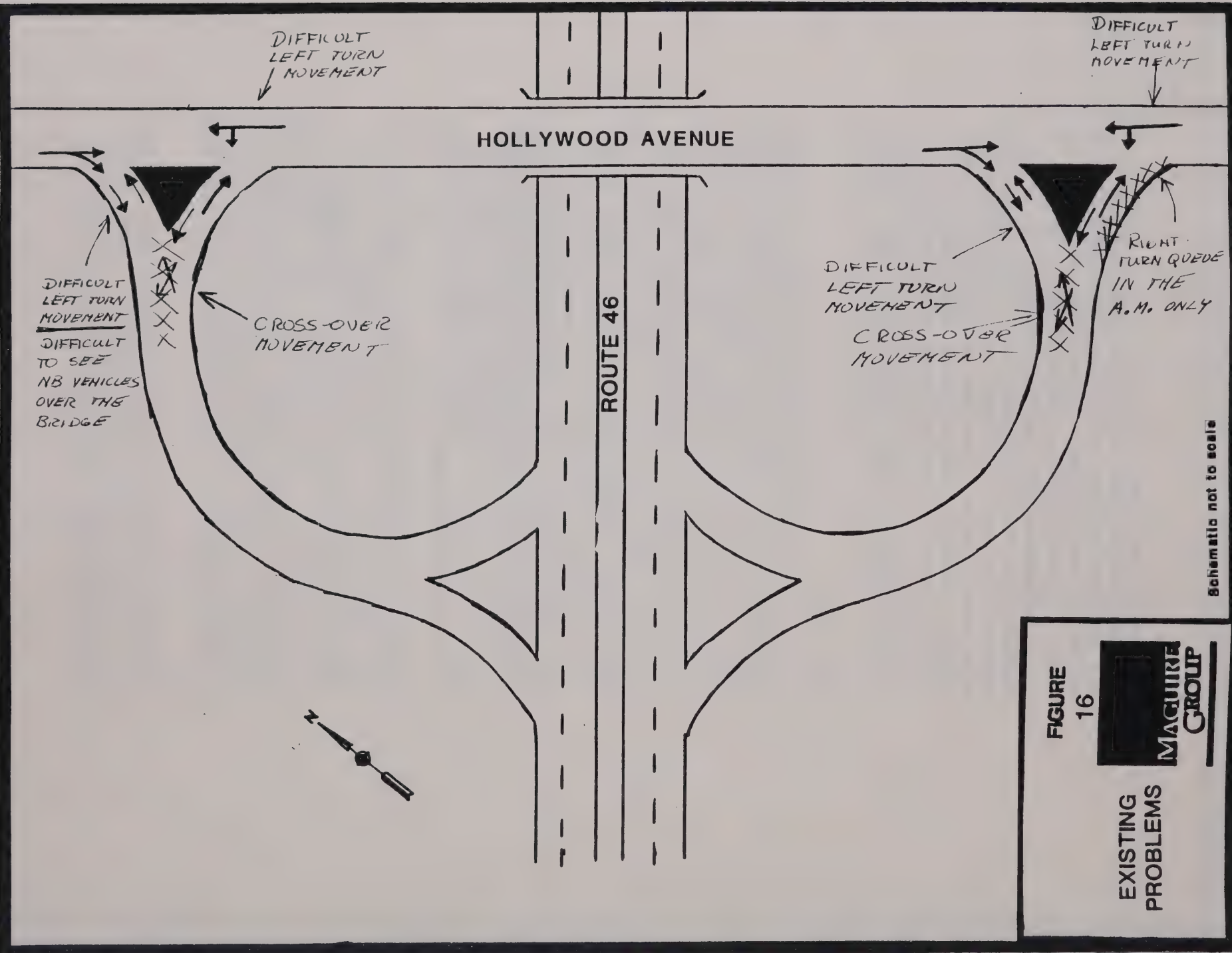
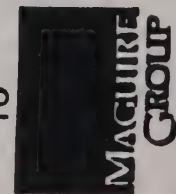


FIGURE
16

EXISTING
PROBLEMS



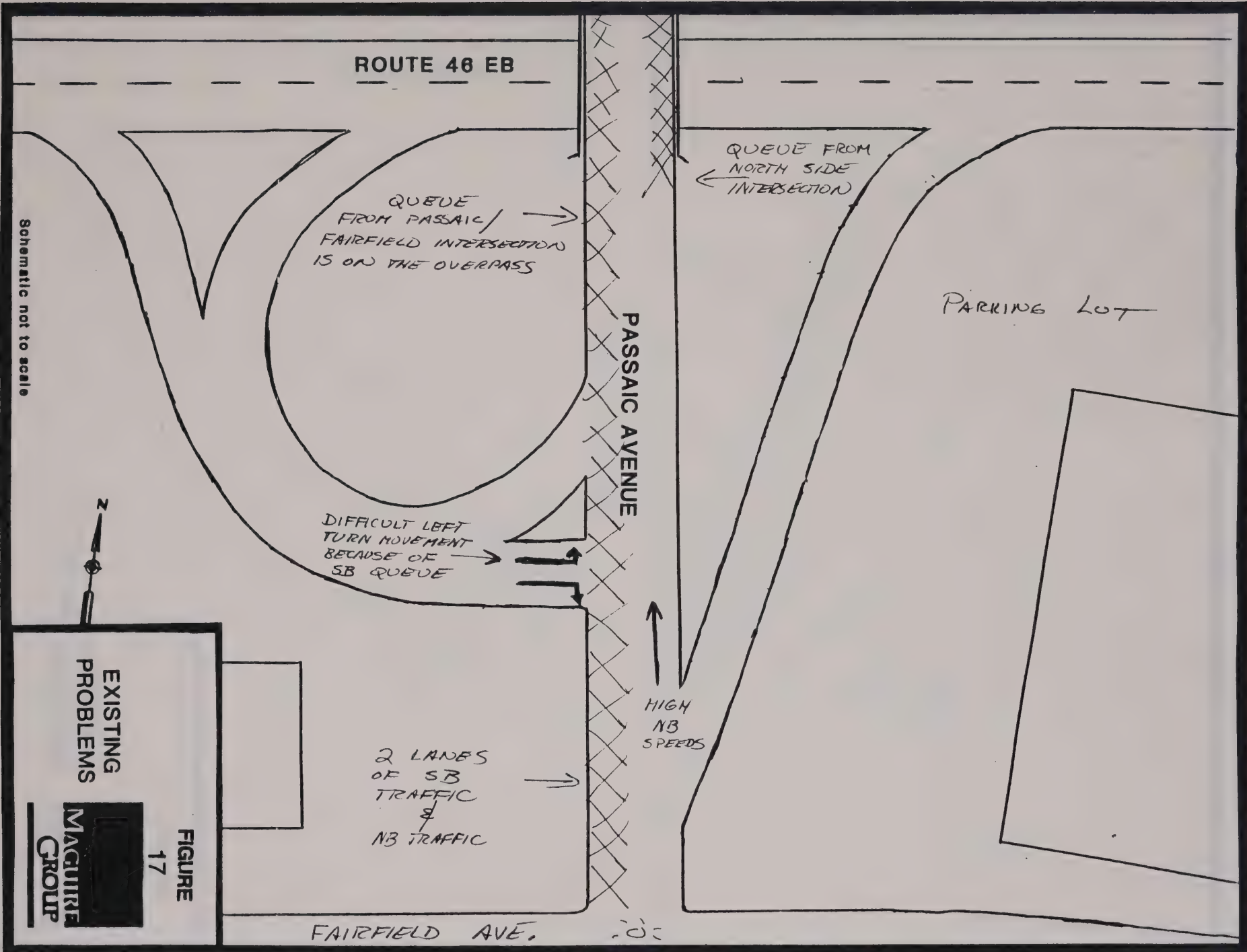
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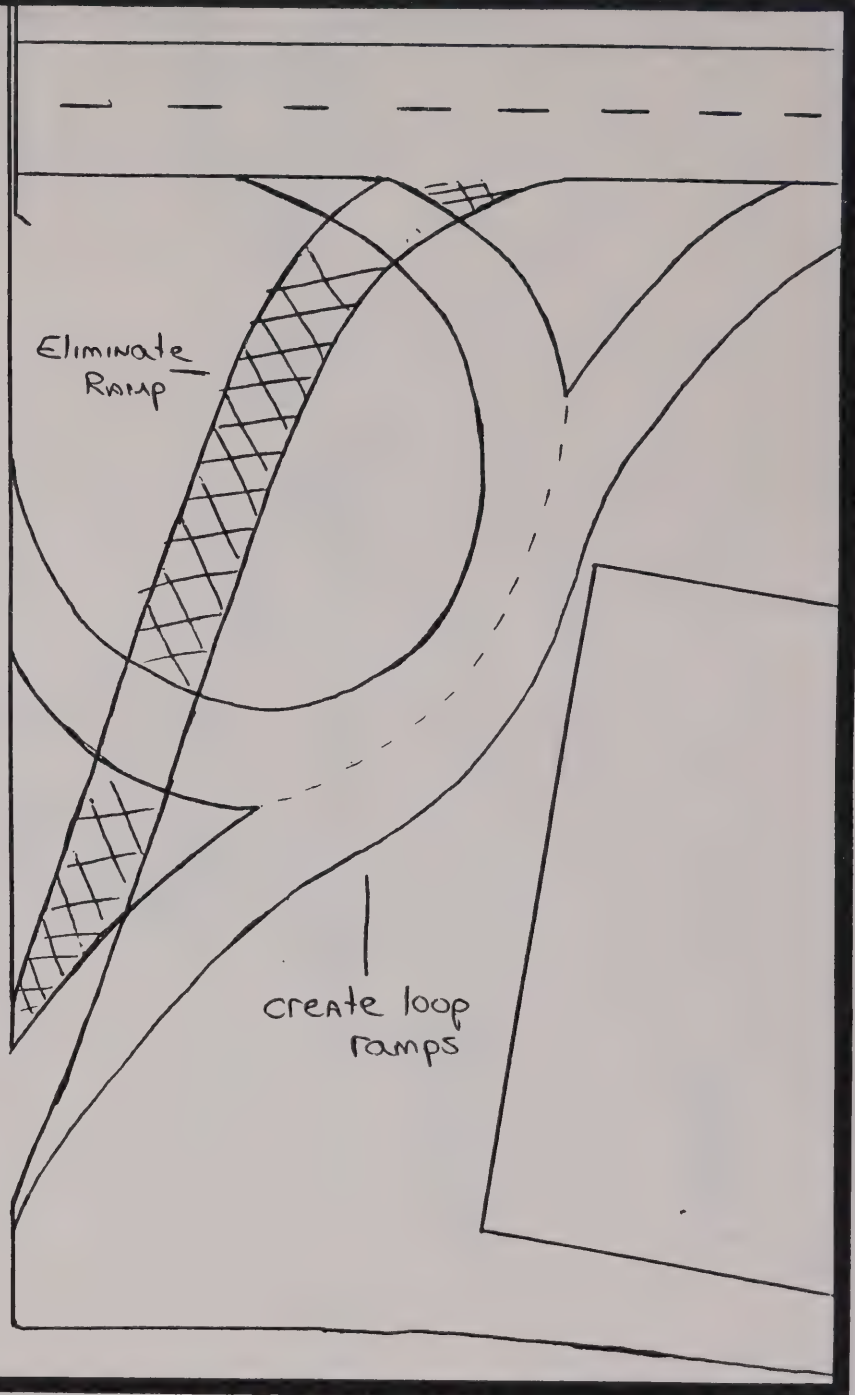
difficult movement across two southbound lanes into heavy traffic volume (See Figure 17). This intersection also had problems with accidents. Most of the accidents occurred with vehicles turning left off the ramp.

A proposed option for this intersection is to create an eastbound off-ramp in the southeast quadrant (See Figure 18). This option would require the partial acquisition of the parking lot at the American Mall for the construction of this loop ramp and to relocate the existing on-ramp to US 46 eastbound. The proposed ramp improvements will permit easier turning movements to and from Route 46 as left turn movements will be eliminated. This recommendation would also help decrease the accidents from the left turn off the ramp.

US 46 westbound off-ramp traffic onto Two Bridges Road backs up onto US 46. The queue length was calculated to 1200 feet using the Guidelines for Air Quality Maintenance Planning and Analysis Volume 9 (Revised) (U.S. Environmental Protection Agency, September 1978) queue length formula. This was also observed during the turning movement counts. The queue was observed past Hoolihan's Restaurant, or approximately Mile Marker 55.18. These vehicles occupied the US 46 WB shoulder. (See Figure 19.) On the Passaic Avenue/Two Bridges Road overpass, the heavy volumes occur in the southbound direction during the AM peak period and northbound in the PM peak period. Both these intersections are directly affected by the traffic light at Passaic and Fairfield Avenue intersection, located immediately south of the US 46 ramps and Passaic Avenue interchange. The southbound queue from this intersection can and does span across the bridge during the peak hours.

There is also a need to increase storage space for the US 46 westbound off-ramp to Two Bridges Road. The LOS is non-deficient for the intersection, but the volume/capacity ratio for the left-turns is greater than 1.0 (100%). Currently, the off-bound ramp appears to be wide enough for two lanes and is utilized that way, however, only half of the ramp is striped for one lane between US 46 and Two Bridges Road. (See Figure 20.) It is recommended that the ramp be restriped to two lanes. This may require some widening if the ramp is not up to specifications. This alone, however, will not solve the problem so it is also recommended that the deceleration lane be widened and extended to accommodate the queue.





PASSAIC AVENUE

Eliminate Ramp

create loop ramps

ROUTE 46 EB

EXTEND MEDIAN

eliminate left turn

Schematic not to scale



PROPOSED SOLUTIONS



FIGURE 18

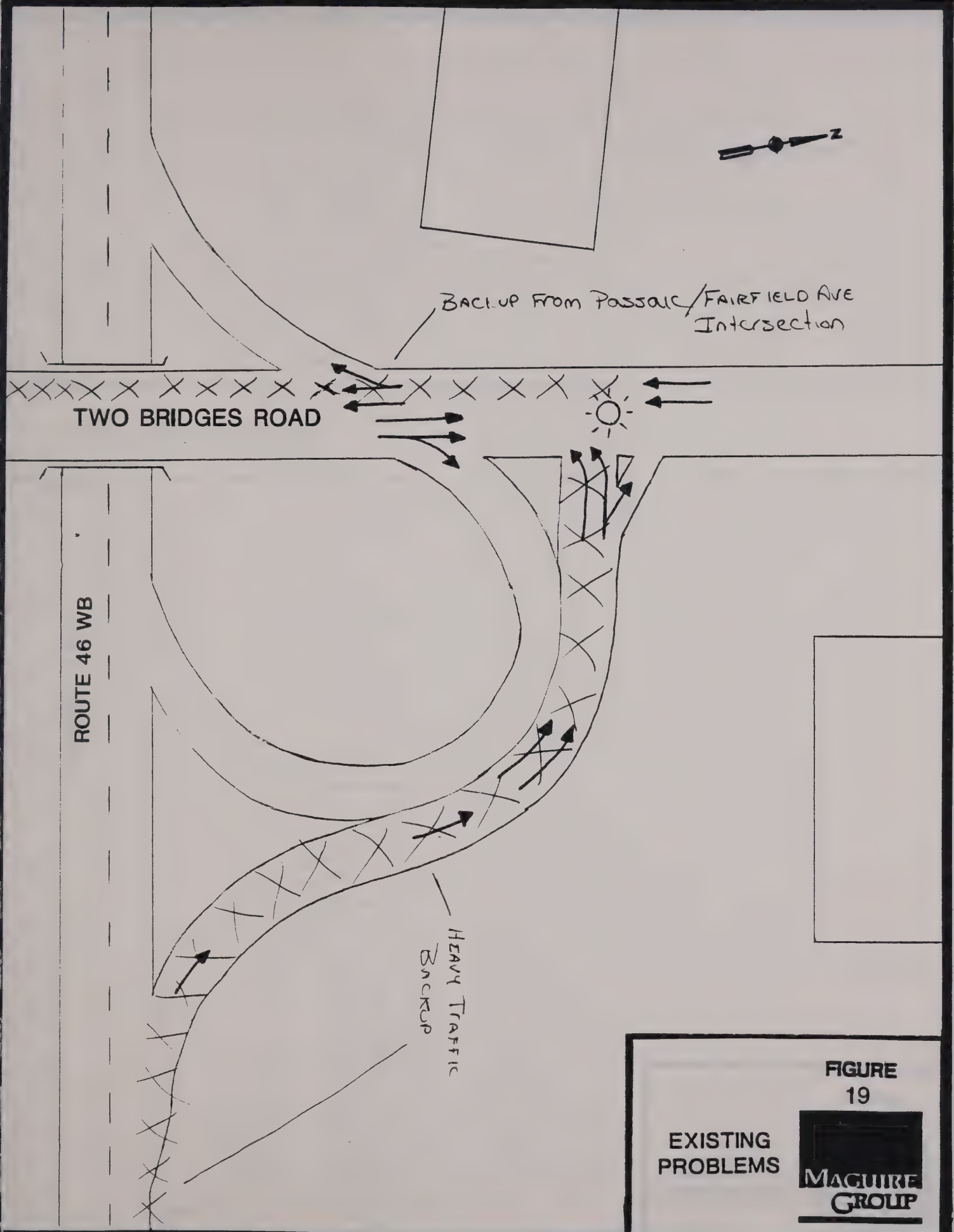


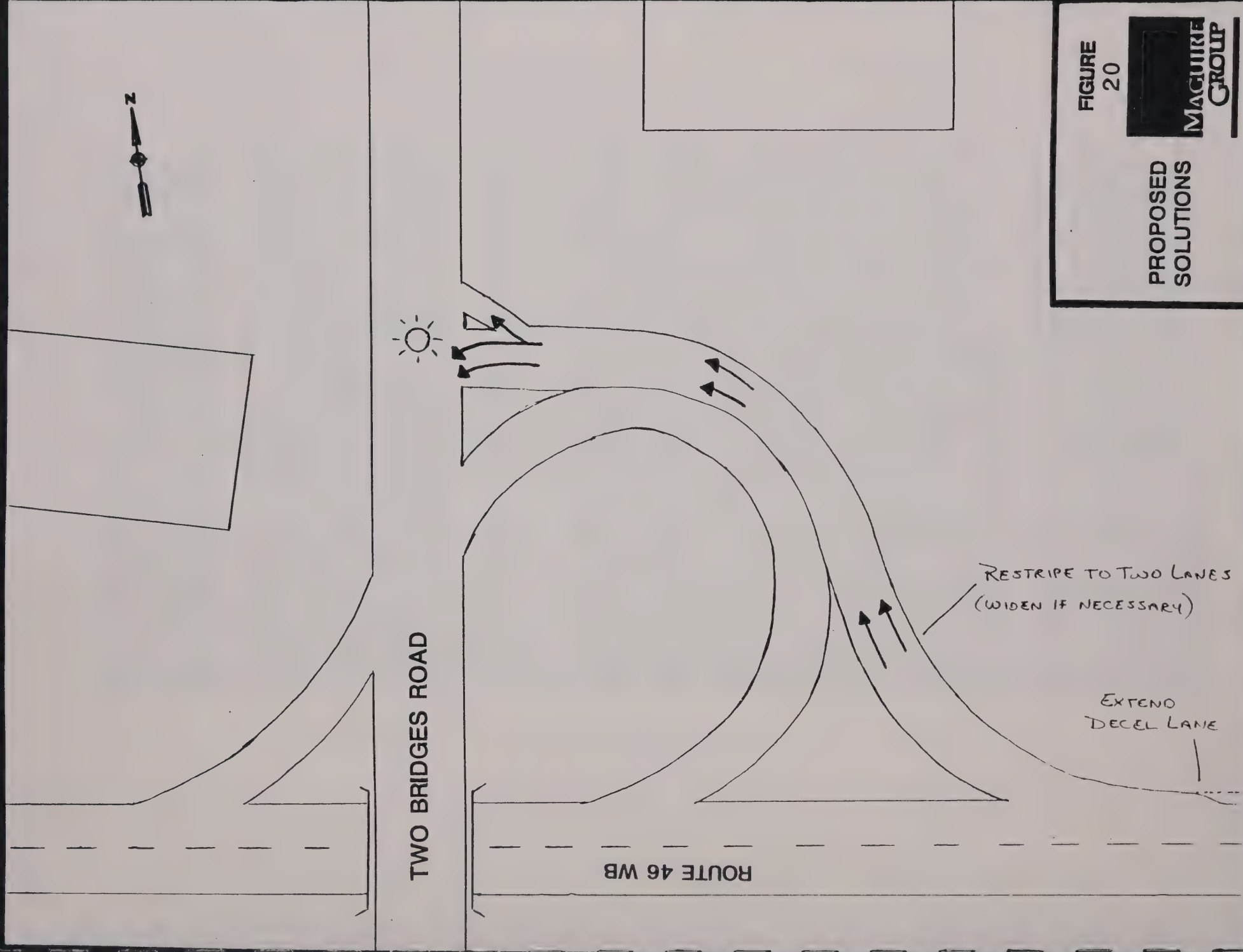
FIGURE
19

EXISTING
PROBLEMS



FIGURE
20

PROPOSED
SOLUTIONS



At the US 46 ramps/Passaic Avenue, it was investigated that a stop light for the southbound approach would create a "gap" for northbound left-turns at this intersection. However, this light would not insure that vehicles would not be "trapped" just past this signal because of the Passaic/Fairfield intersection.

Although the Passaic/Fairfield Avenue intersection was not studied in this project, it deserves some mention because it is the cause of the problems at both the Passaic Avenue/Two Bridges Road ramp intersections. It was observed during turning movement counts that the intersection operated satisfactorily, i.e., most vehicles were able to make it through the intersection during one cycle, however, because of the heavy volume of traffic at the intersection, it also caused problems at other areas, such as the driveways for businesses located near this intersection.

The Fairfield Avenue interchanges with US 46 operate at an adequate level-of-service and require no improvements.

This arterial section of US 46, at worst, has an existing and predicted deficiency of LOS E for the peak hour directional flows between the Hollywood Avenue and US 46/NJ 23/I-80 interchanges. The construction of an additional through lane will help the westbound deficiency. The eastbound direction could show a better LOS and v/c ratio, but this does not take into account the loss of the additional lane at the US 46/NJ 23/I-80 interchange. A backup of traffic will occur because the loss of the lane will create a merge from three to two lanes at the US 46/NJ 23/I-80 interchange. A third lane for US 46 eastbound movement through the interchange must also be added to achieve the full benefit of a third lane west of the US 46/NJ23/I-80 interchange in the eastbound direction. The LOS is predicted to be 'D' in the 1996 eastbound P.M. peak hour west of Hollywood Avenue. The eastbound constraint is the US 46/NJ23/I-80 interchange. The loss of the third through lane in the westbound direction at the Hollywood Avenue interchange would not be significant. The LOS is predicted to be "D" in 1996 the westbound AM peak hour west of Hollywood Avenue.

There is a U-turn from US 46 eastbound to US 46 westbound immediately east of the Willowbrook Mall overpass. This U-turn is relatively obscure and there are no acceleration/deceleration lanes or storage lanes at this U-turn. The third through lane proposal will, through widening, eliminate the U-turn. There is no significant need for the U-turn and with the proper signing, the U-turn movement can be made at the Willowbrook Mall interchange.

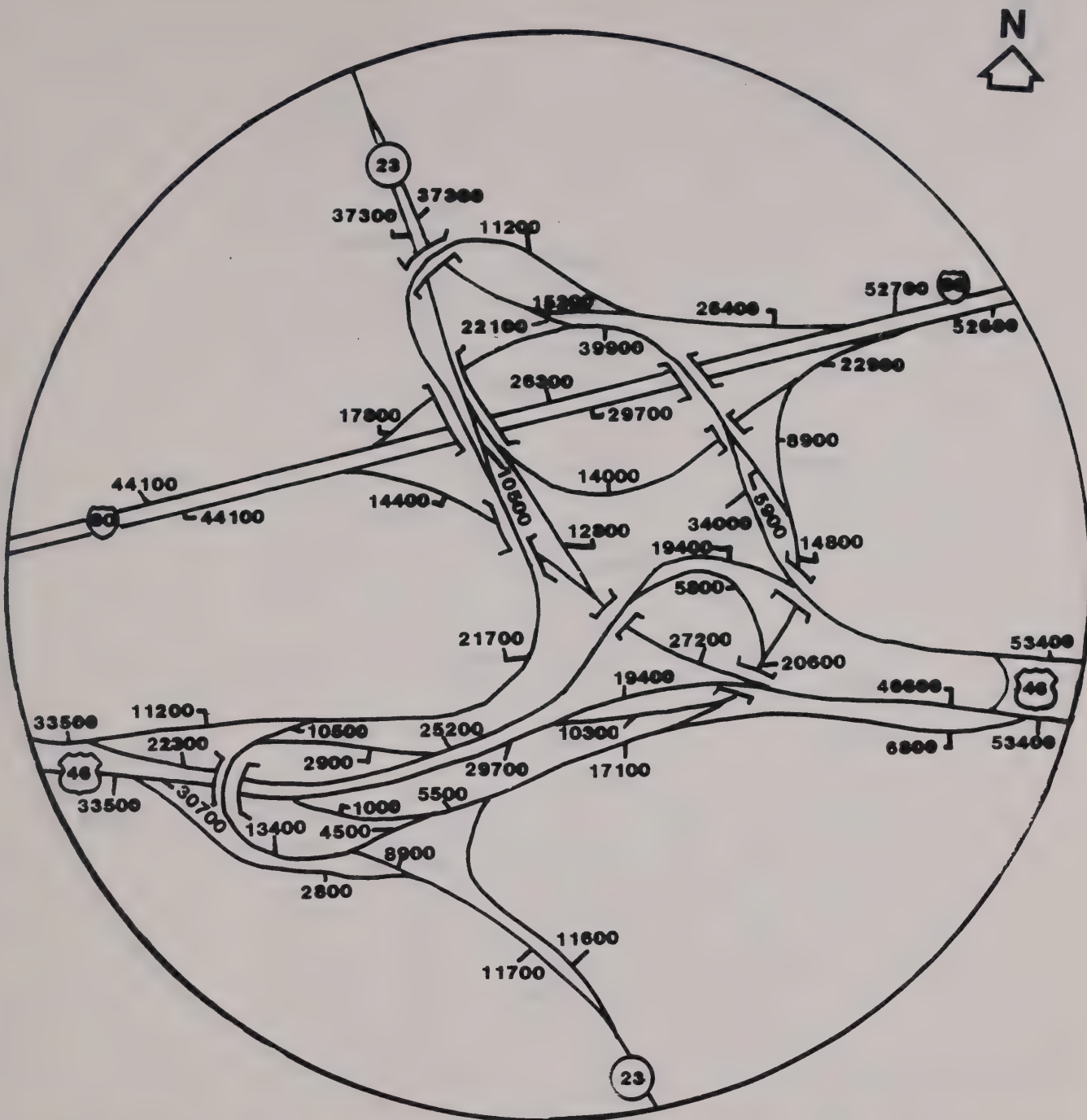
3. Area 3 - US 46/NJ 23/I-80 Interchange -

The US 46/NJ 23/I-80 interchange is a melange of ramps that serves most of the movements between US 46, NJ 23 and I-80 along with some service and frontage roads. There are few acceleration/deceleration lanes and there are numerous add-a-lane and drop-a-lane merge conditions.

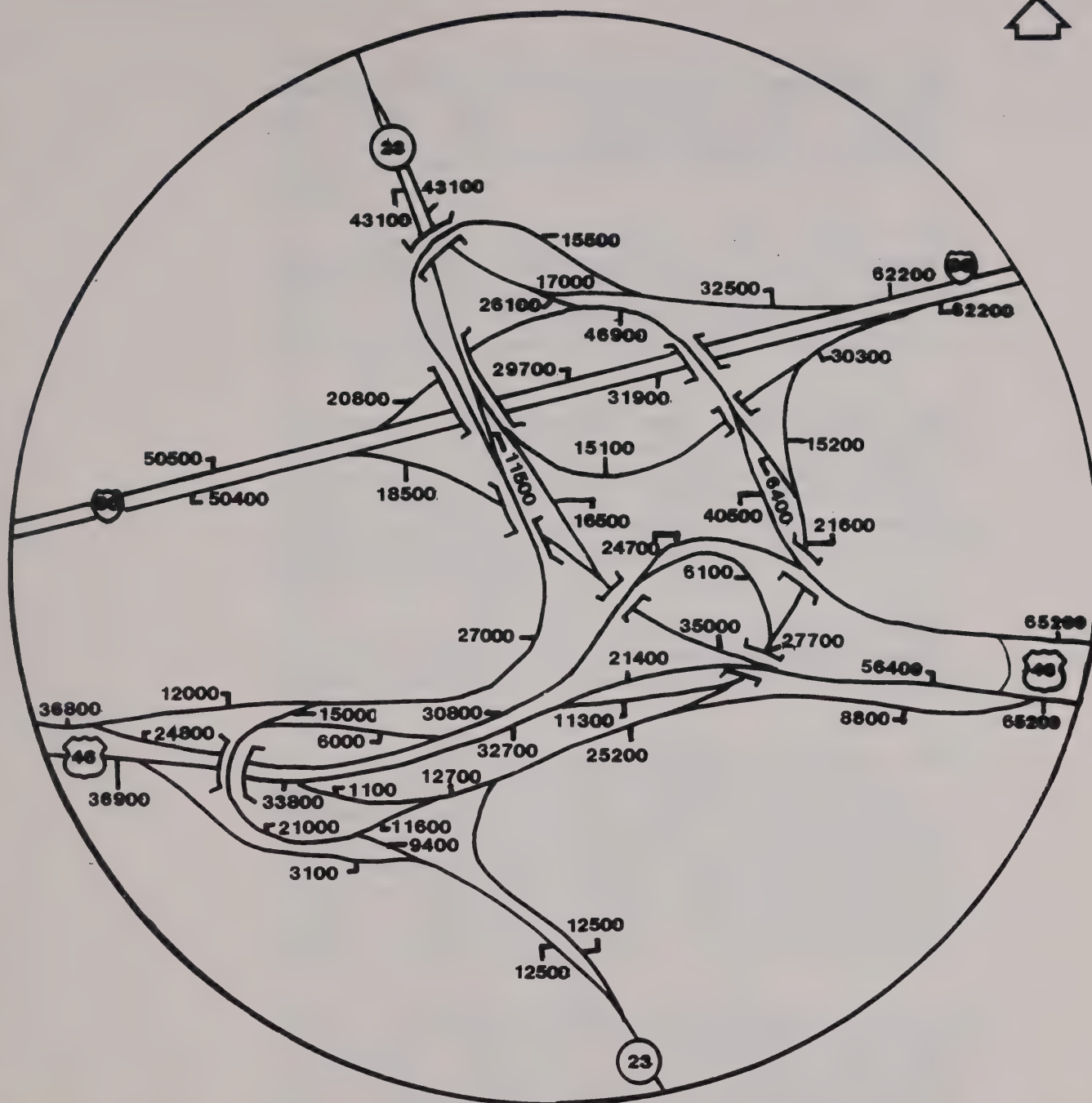
Current interchange ADT volumes are shown in Figure 21. The intersecting roads bring varying traffic volumes that are "mixed" through the ramp system. US 46 has 53,400 vpd from the east and 33,500 vpd from the west. Interstate 80 brings in 52,700 vpd from the east and 44,100 from the west. NJ 23 brings in 37,300 from the north and 11,600 from the south. Significant traffic volumes flow between points east and north. Approximately 29,000 $[(22,100 - 5,900) + 12,800]$ vpd flow between the east (from US 46) and the north. Approximately 29,200 $(15,200 + 14,000)$ vpd flow between the east (I-80) and the north. There are also significant cross-over traffic volumes between US 46 and I-80. Approximately 26,300 $(14,400 + 11,900)$ travels between the west (I-80) and the east (US 46). US 46 through traffic is approximately 38,800 $(19,400 + 19,400)$ vpd in each direction.

The estimated 1996 US 46/NJ 23/I-80 interchange ADT volumes are shown in Figure 22. The north to east and east to north traffic flows are more prominent in the future scenario than the existing condition. The trend for US 46 indicates that the traffic volumes on the eastern side of NJ 23 will grow more than the west side. US 46 traffic is predicted to increase by more than 20 percent on the east side while only 10 percent on the west side. The estimate increase of US 46 traffic volumes are from 106,800 vpd to 130,400 vpd on the east side, a 22 percent change and grow from 67,000 vpd to 73,700 vpd on the east side, a 10 percent increase. Interstate 80 traffic volumes are predicted to increase from 105,300 vpd to 124,400 vpd on the east side, an 18 percent increase and 88,200 vpd to 100,900 vpd on the west side, a 14 percent increase. NJ 23 volumes are predicted to increase by 15 percent on the north side, from 74,600 vpd to 86,200 vpd. NJ 23 volumes on the south side are predicted to have a minimal increase of 7 percent, from 23,300 vpd to 25,000 vpd.

Slow peak hour speeds are experienced throughout this ramp system as one merge/diverge problem dominoes back into other merge/diverge areas. It functions, but not as efficient as a properly designed interchange. Accidents were also a problem at this entire inter-



US 46/NJ 23/I 80 INTERCHANGE 1989 ADT



US 46/NJ 23/I 80 INTERCHANGE 1996 ADT

change. Most of the accidents were a result of the weaving/merging process that occurs throughout the interchange. Many of the accidents also occurred at night. The peak hour accident frequency is lower because of the slow operating speeds and geometric design.

Capacity problems exist at the US 46/NJ 23/I-80 interchange because of poor merge/diverge areas, improper or lack of acceleration/deceleration lanes and geometric constraints that decrease traffic speeds. Capacity is also constrained because many of the ramps perform as multi-function segments.

There are also poor turning radii, blind spots, ramps that instantly merge with through traffic, improper signing, diverge locations that force traffic flow in a certain direction or force vehicles to make lane changes, merge and diverge locations that are too close together and the lack of facilitating for all possible directional movements.

Land use constraints include wetlands areas, Willowbrook Mall, the service road commercial development located along side or between the I-80/US 46 roadways and the railroad bridge crossings.

This interchange was never planned to exist as it does with three major roadways converging on one area. It evolved that way by the additions of I-80 and the NJ 23 evolution to a multilane highway. The location of commercial development and the railroad also contributed to the formation of this interchange. The interchange is functional but there are operational difficulties for the drivers that are not familiar in navigating through here.

Not all directional movements are provided for at this interchange. There is no I-80 EB to NJ 23 NB movement and I-80 EB to US 46 WB movement. As mentioned previously, there are many ramps that provide multi-directional service functions. But despite its problems it does function.

The signing has to be improved. Drivers not familiar with the area can be forced into directions they may not want to go or it may cause dangerous crossing movements to correct a vehicle's direction.

There is currently no direct movement between I-80 on the west side to NJ 23 to the north side. This forces vehicles to use US 46 instead of I-80 to access NJ 23 NB from points west of this area. The construction of I-287 to the northwest may reduce the need for this

connection, though, some of the deficiencies attributable to this area may be caused by transportation system deficiencies outside the study area. One of these deficiencies involves the lack of a direct connection between I-280 and I-80 EB. Drivers then have to use US 46 to get to points east in the US 46/I-80 corridor.

There is also no movement between NJ 23 on the south side to NJ 23 on the north side. This forces the NJ 23 through trips to share roadways with numerous other interchange movements.

The recommended improvement would be to reconstruct the entire interchange to facilitate the greatest volumes into the easiest movements. If piecemeal improvements are implemented, for example, a new span for NJ 23 through movements or a ramp for NJ 23 SB to I-80 WB, it would just be a continuation of the evolution of additions that led to the formation of the problems at this interchange. To do this and to minimize land use impacts, this improvement would have to incorporate tri-level designs which would result in significant costs.

There are no site specific improvements or spot improvements that can solve the complex problem at this interchange. This entire interchange had a significant number of accidents, most of which were between vehicles traveling in the same direction and were caused by the weaving and merging required to get through the interchange to their ultimate destination.

However, short of the recommendation to reconstruct the entire interchange, the facilitation of the major movements for their exclusive use is recommended. This includes NJ 23 through movement, I-80 EB to US 46 EB and US 46 WB to NJ 23 NB. A design study is necessary for these improvements. A complete reconstruction would help lower the number of accidents providing the major movements are given a more direct route.

4. Area 4 - US 46/NJ 23/I-80 Interchange to the US 46/NJ 3 Interchange

The area east of the US 46/NJ 23/I-80 interchange to NJ 3 includes a 4-7 lane arterial with grade-separated interchanges at Riverview Drive, Union Avenue, McBride Avenue, Browertown Road, Lower Notch Road and Rifle Camp/Notch Road. There is also an at-grade intersection with Clove Road. Numerous commercial development are also characteristic of the area. The area has marked and unmarked shoulder areas and some areas of no-shoulders. These interchanges have small turning radius with insufficient storage in some places.

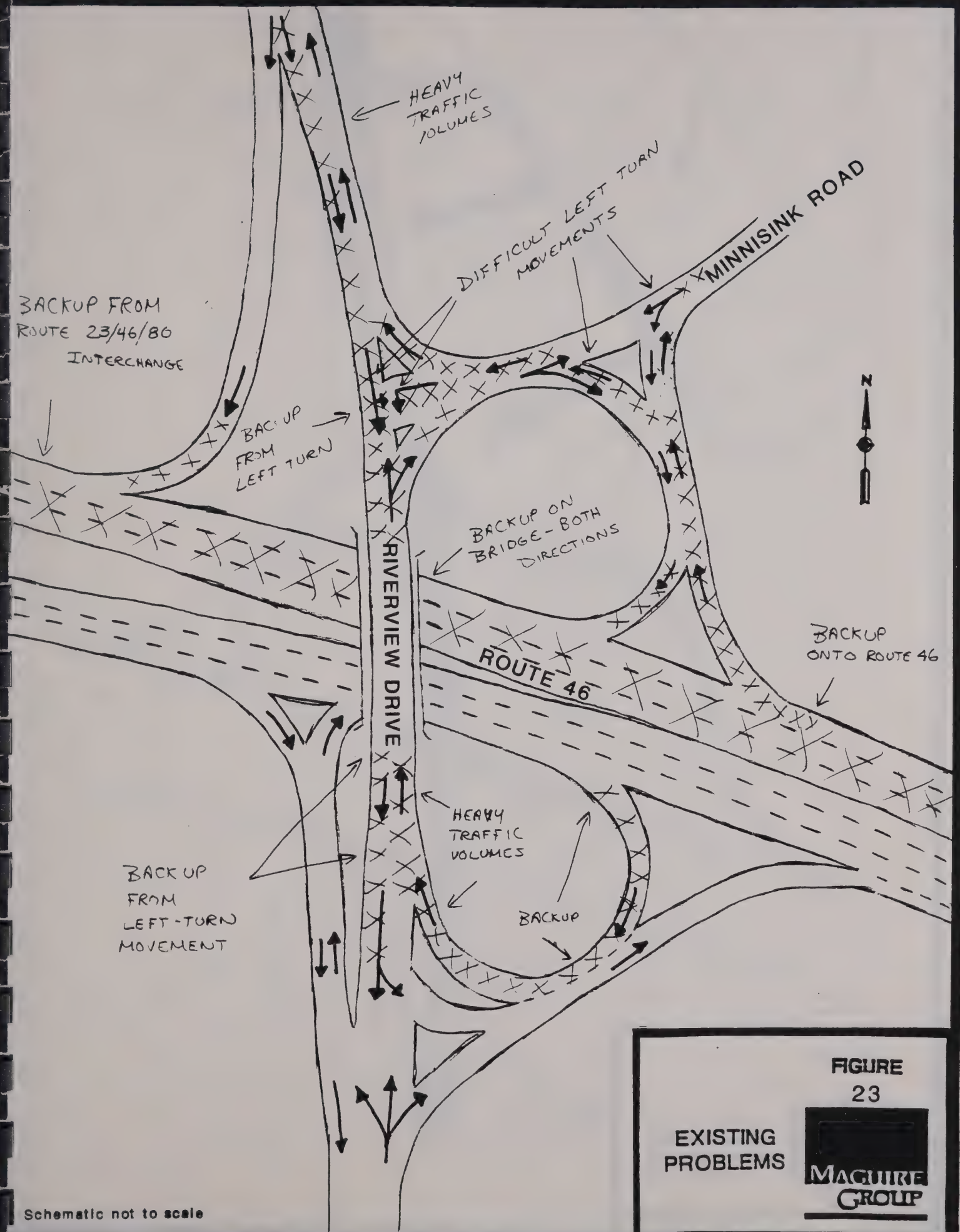
US 46 at Riverview Drive Interchange - Current ADT volumes on US 46 are 118,900 west of the interchange and 124,100 east of the interchange. Riverview Drive carries an estimated 28,200 vpd north of the interchange and 21,800 vpd south of the interchange.

The estimated 1996 ADT volumes for US 46 are 136,600 west of the interchange and 142,500 east of the interchange. The future predicted ADT volumes on Riverview Drive are 30,200 north of the interchange and 23,400 south of the interchange. The US 46 ramps/Riverview Drive, Riverview/Minnisink Road and US 46 ramps/Minnisink Road intersections are currently have deficient levels-of-service. There are poor sight lines, turning radii and short acceleration/deceleration lane problems at these intersections. The intersection of Riverview Drive and the US 46 EB on-off ramps creates queues that extend across the overpass because southbound left turns block southbound through traffic for lack of passing space. The Riverview/Minnisink intersection westbound approach traffic backs into the Minnisink/US 46 WB on-off ramp intersection, which then backs traffic onto US 46 westbound (See Figure 23). Accidents were a significant concern at this intersection. No single vehicle movement stands out here. This indicates that there are numerous turning conflicts at the interchange. The accidents occurred in many different places and for different reasons.

This interchange is under design study (See Figure 24). The conceptual improvements will improve the encountered deficiencies. The improvements will also help improve the accident situation as they will reduce many of the opposing turns that are being made. It is also recommended that the Riverview Drive/US 46 EB on-off ramp intersection have a traffic signal to allow the 700-800 southbound left turns onto US 46 EB during a signal phase and not through random turns through gaps created by opposing northbound traffic.

US 46 at Union Boulevard Interchange - Current ADT volumes on US 46 are 124,100 west of the interchange and 118,400 east of the interchange. Current Union Boulevard ADT volumes are 29,600 north of the interchange and 13,700 south of the interchange. Estimated 1996 ADT volumes on US 46 are 142,500 west of the interchange and 126,400 east of the interchange. Union Boulevard will increase to 30,900 vpd north of the interchange and 14,300 vpd south of the interchange.

The westbound US 46 ramp termini with Union Boulevard provide an unsatisfactory level of service. The 1996 analysis revealed the same LOS (E AM/F PM). This is

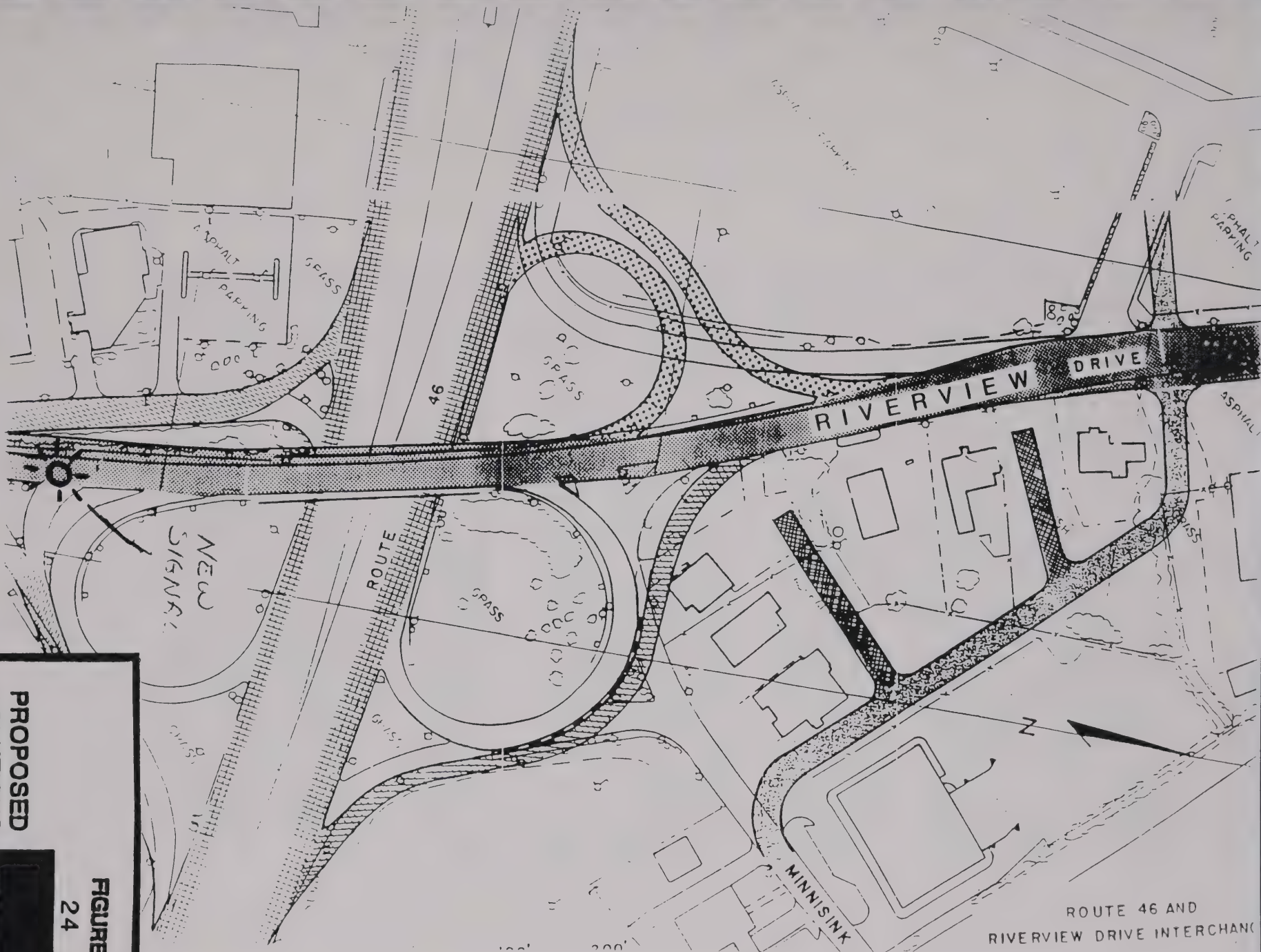


Schematic not to scale

FIGURE
23

EXISTING
PROBLEMS





ROUTE 46 AND
RIVERVIEW DRIVE INTERCHANGE

FIGURE
24

PROPOSED
SOLUTIONS

SOURCE: N.J.DOT



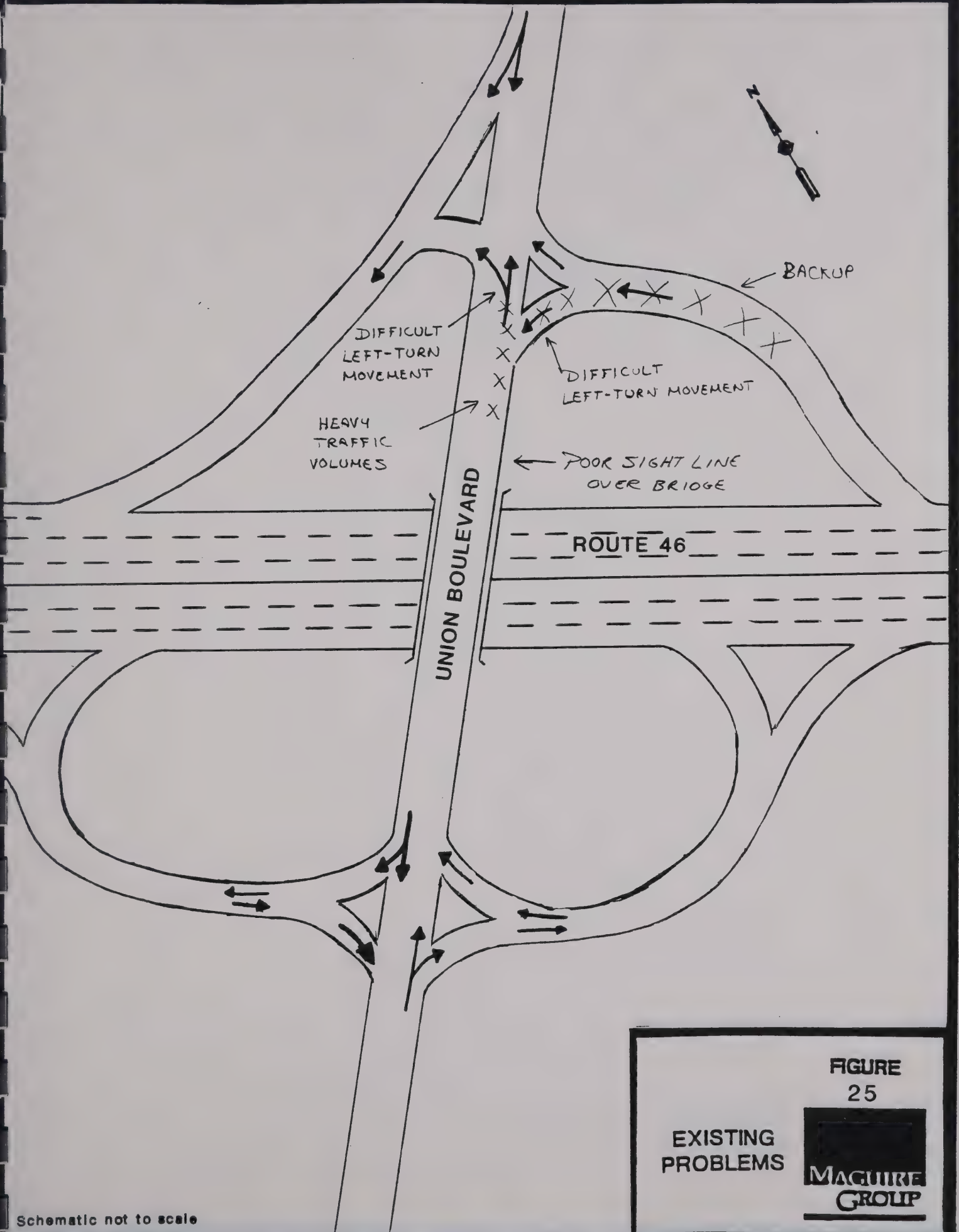
primarily due to vehicles turning left for southbound travel on Union Boulevard. The high through volumes on Union Boulevard do not easily permit this left turn movement. In addition, the sight distance for left turning motorists is poor. Northbound vehicles on Union Boulevard cannot be seen until they reach the top of the bridge over Route 46. (See Figure 25.) This interchange also had problems with accidents. Most of the accidents were caused by motorists caught in the left turn queue attempting to travel straight through the intersection. These vehicles would collide with other vehicles traveling straight through.

The construction of a loop ramp in the northwest quadrant of this interchange was investigated in order to provide a smoother westbound to southbound movement. However, it would require the taking of parking lot space and would require the relocation of the existing finger ramp.

Therefore, to improve the existing and projected traffic operations and to resolve the sight distance problem, it is recommended that a traffic signal be installed at the intersection of the westbound Route 46 ramp with Union Boulevard. (See Figure 26.) The LOS with a signal would be improved to "B" in both the 1996 AM and PM scenarios. These improvements would also help decrease the number of accidents because the left turn lane would now be an exclusive left turn lane with the signal.

The US 46 eastbound to southbound off-ramp provides for only right turns and has moderate traffic volumes. The LOS analysis indicated that this intersection will provide satisfactory traffic operations. Therefore, no action is necessary. (See Figure 25).

US 46 at McBride Avenue Interchange - Current ADT volumes on US 46 are 118,400 west of the interchange and 111,100 east of the interchange. Current ADT volumes on McBride Avenue are 12,300 north of the interchange and 11,900 south of the interchange. Estimated 1996 ADT volumes on US 46 are 126,400 west of the interchange and 118,600 east of the interchange. McBride Avenue ADT volumes are estimated to be 12,500 north of the interchange and 12,100 south of the interchange.

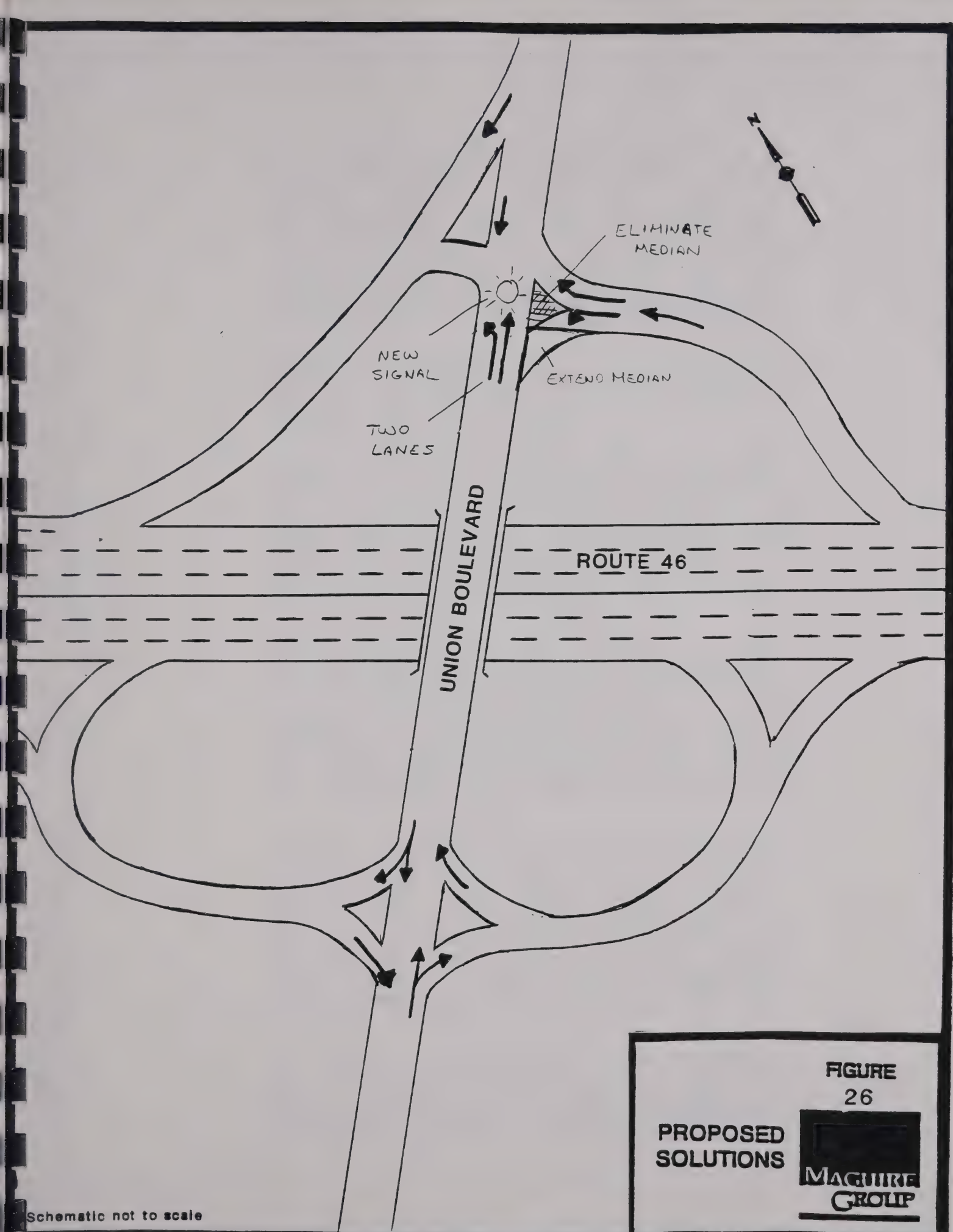


Schematic not to scale

FIGURE
25

EXISTING
PROBLEMS





Schematic not to scale

FIGURE
26

PROPOSED
SOLUTIONS



The intersection capacity analysis was applied to the Route 46 ramp termini with McBride Avenue. The LOS will be satisfactory for both the AM and PM peak hours in 1996. Consequently, no intersection improvements are recommended. However, both the eastbound and westbound ramps with Route 46 have poor turning radii triangle islands, a short ramp distance and no acceleration/deceleration lanes (see Figure 27). This intersection is currently under design study by NJDOT, to be redesigned with geometric improvements (see Figure 28).

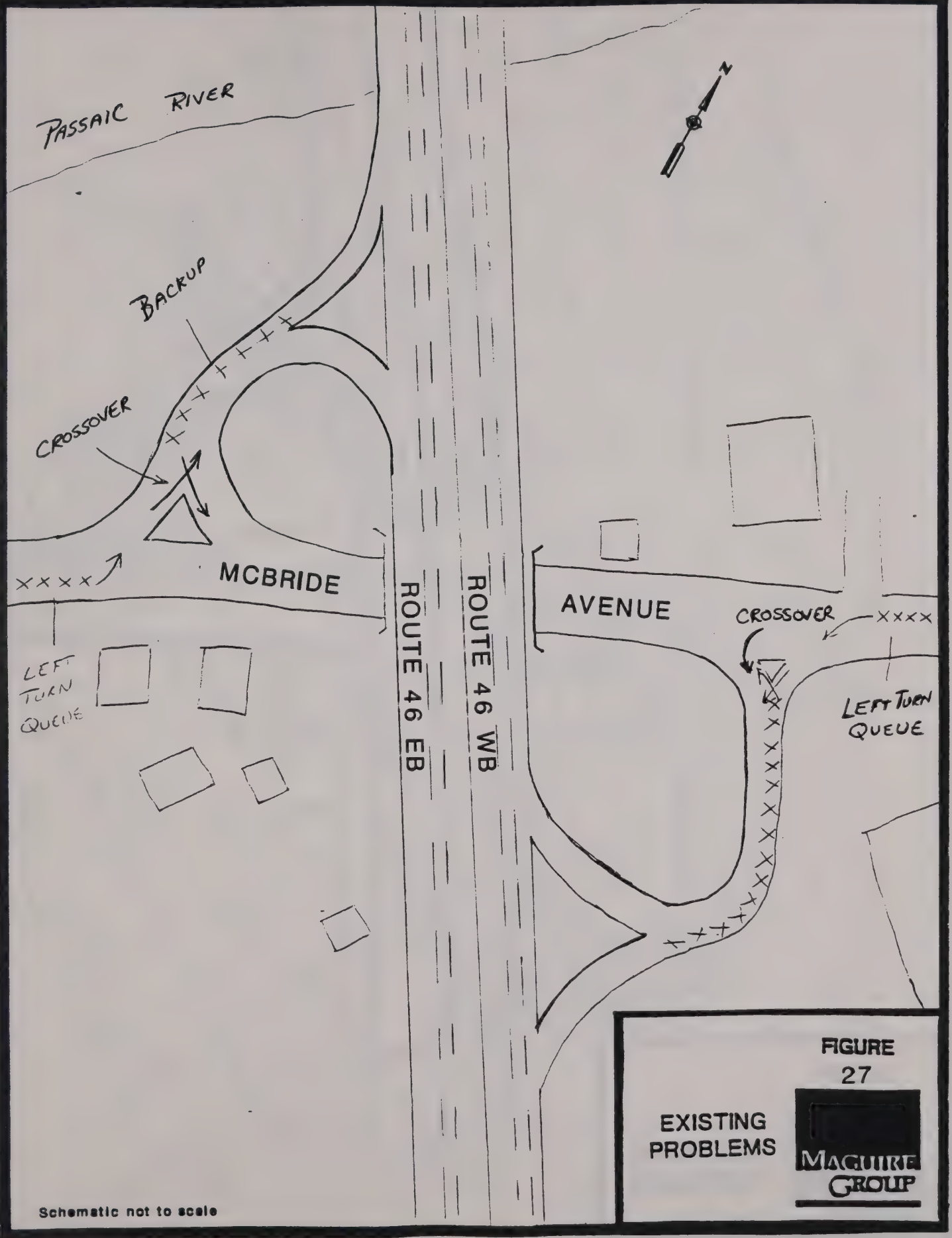
Although the intersection LOS is satisfactory, the construction of acceleration and deceleration lanes on Route 46 would significantly improve the movement of vehicles to and from the highway.

US 46 at Browertown Road Interchange - Current ADT volumes on US 46 are 111,100 west of the interchange and 115,600 east of the interchange. Browertown Road volumes are 19,900 north of the interchange and 11,100 south of the interchange. Estimated 1996 ADT volumes on US 46 are 118,600 west of the interchange and 123,500 east of the interchange. Estimated Browertown Road ADT volumes are 20,200 north of the interchange and 11,300 south of the interchange.

During the AM peak hour, both of the US 46 ramp termini with Browertown Road will provide a satisfactory LOS. During the PM peak, the LOS is "E" at both locations. It is important to note that the termini of both ramps experience a high volume of left turns, particularly the eastbound on/off ramp. In addition, the ramps have poor turning radii and short ramps lengths (see Figure 29). The westbound on/off ramps are in close proximity to the Caldor Plaza access.

While the installation of a traffic signal would correct the LOS problems, the PM peak hour traffic operations alone do not justify the installation of a traffic signal. During turning movement counts, observations at the Browerton Road EB ramps showed that the traffic queue on the ramp was long enough to backup onto Route 46. There is also a poor sight distance problem for motorists turning left onto Browertown Road. The bridge abutment interferes with the sight distance to the left.

Construction of additional ramps on the east side of this interchange (reverse loops) are not feasible because of slope constraints, dense development and watercourse encroachment. Therefore, to improve the capacity problems at the intersection of the Route 46



Schematic not to scale

FIGURE
27

EXISTING
PROBLEMS



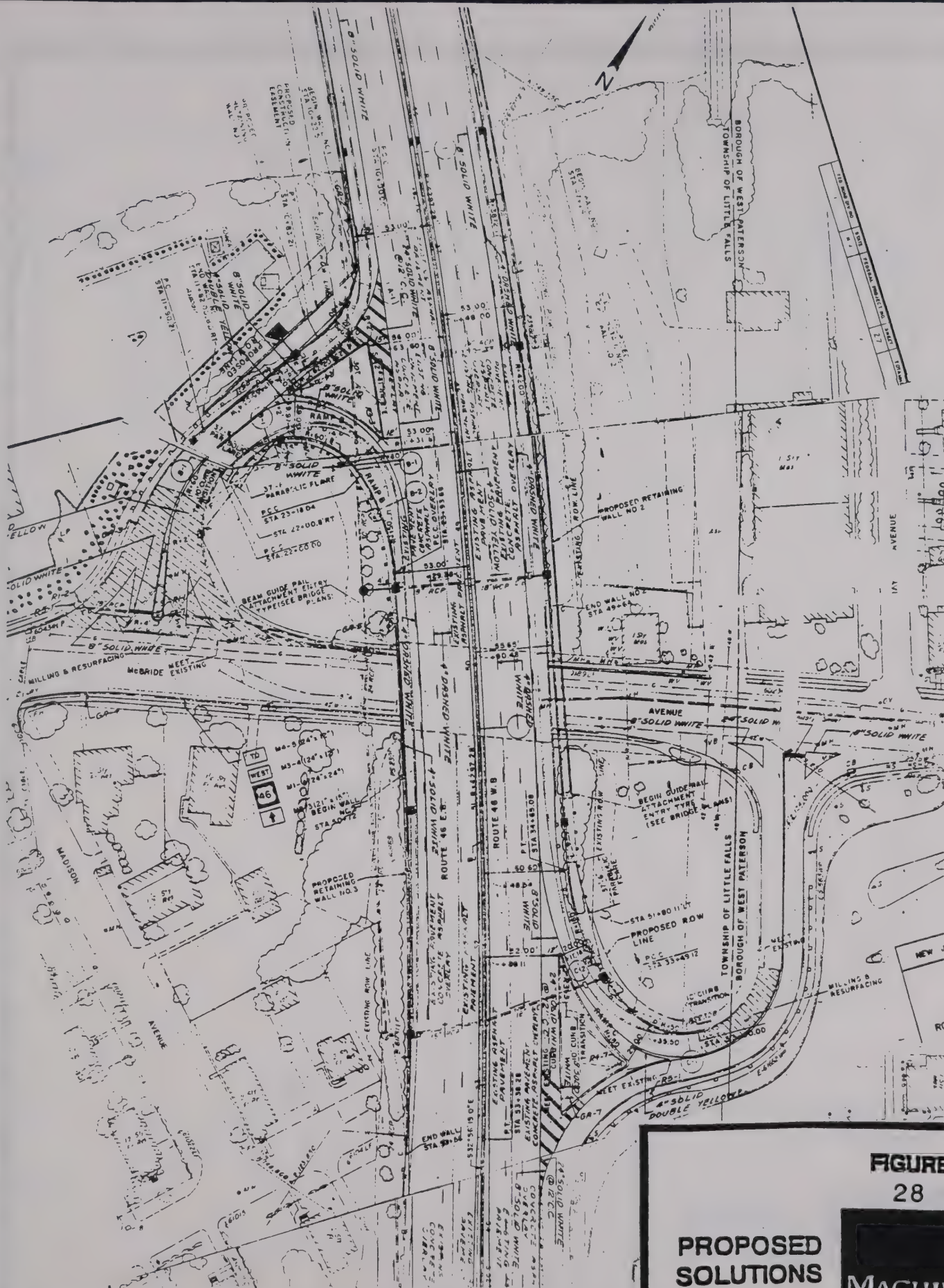
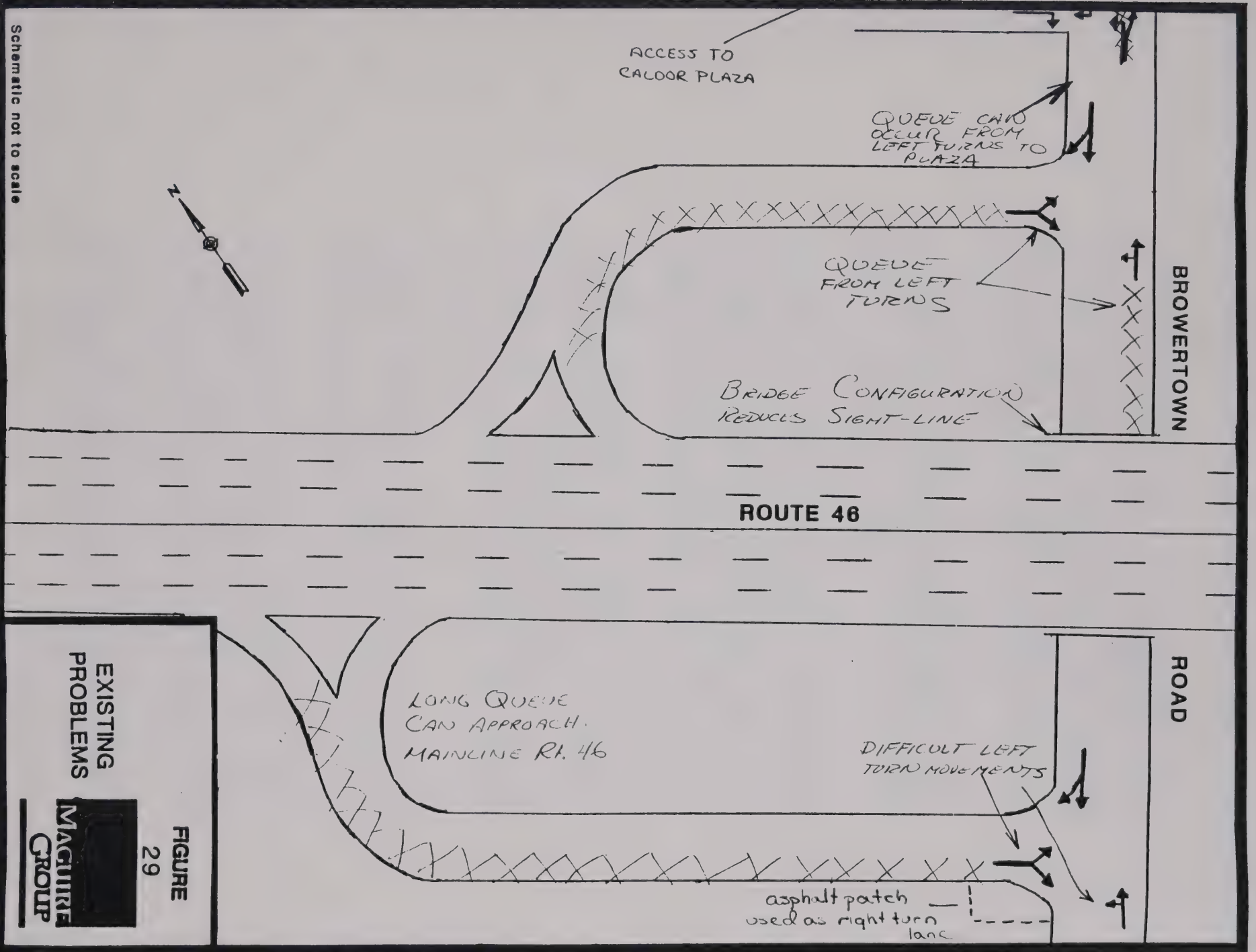


FIGURE
 28

**PROPOSED
 SOLUTIONS**



SOURCE: N.J.DOT



EB ramp with Browertown Road and to resolve the existing sight distance problem, it is recommended that a traffic signal be installed. (See Figure 30.) It is also recommended that the eastbound off-ramp at Browertown Road be widened to accommodate a full right turn lane. Currently, a small area of pavement adjacent to the travel lane is being used as a right turn lane. It should be improved to properly accommodate the movement.

A signal at the intersection of the Route 46 WB ramp with Browertown Road is not justified based on this analysis. However, by 1996, a signal warrants analysis should be conducted. Accidents were not a significant problem at this intersection.

US 46 at Notch Road/Rifle Camp Road - Current ADT volumes on US 46 are 115,600 west of the interchange and 117,800 east of the interchange. Notch Road carries 16,200 vpd and Rifle Camp Road carries an estimated 6,400 vpd. Estimated 1996 ADT volumes on US 46 are 123,500 west of the interchange and 126,300 east of the interchange, Notch Road is estimated to be 16,400 and Rifle Camp Road is estimated to be 6,700.

The Notch Road interchange with US 46 eastbound has two separate intersections. The eastbound off-ramp is located approximately .05 mi. west of the eastbound on-ramp. The off-ramp intersection does not have a deficient level-of-service, but it is short and has a poor sightline. The eastbound on-ramp has a level-of-service of "E" for both the AM and PM peak periods. These intersections do not require any improvements at this time.

The Rifle Camp Road intersection with the US 46 westbound on-off ramp has deficient left turn LOS from the ramp traffic. It has a poor sightline, it is in close proximity to Lackawana Avenue, and has a triangle island (See Figure 31).

The US 46 WB on-off ramp at Rifle Camp Road was modeled as a signalized intersection (See Figure 32). This will improve the intersection to an acceptable level-of-service. However, in the long-term, consideration should be given to realignment of Lackawana Avenue with the Route 46 westbound ramp at Rifle Camp Road. This would create a standard four-legged intersection.

The Lower Notch Road and Clove Road interchanges with US 46 have acceptable levels-of-service do not require improvements currently or in the future.

Schematic not to scale

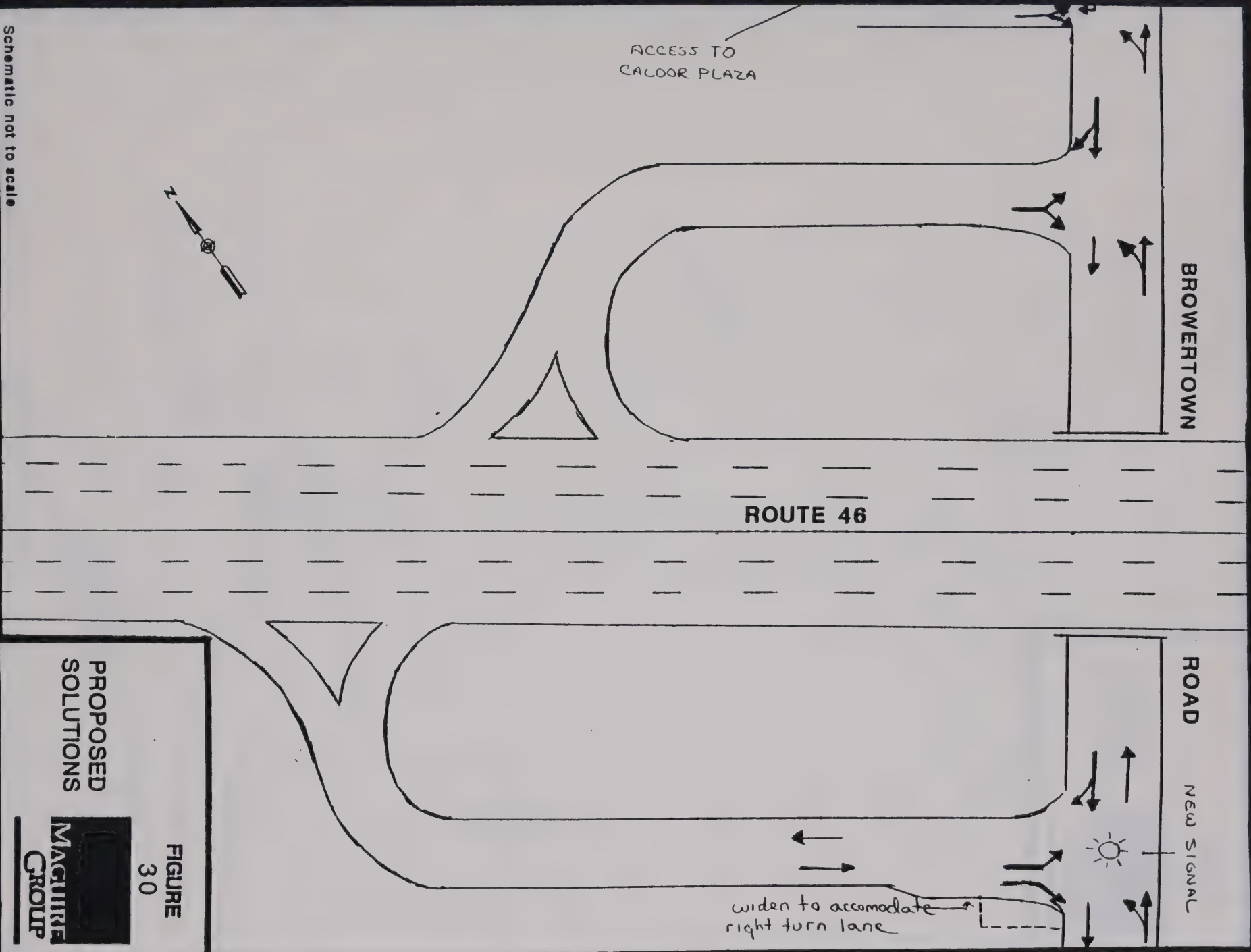


FIGURE
31

EXISTING
PROBLEMS

**MAGUIRE
GROUP**

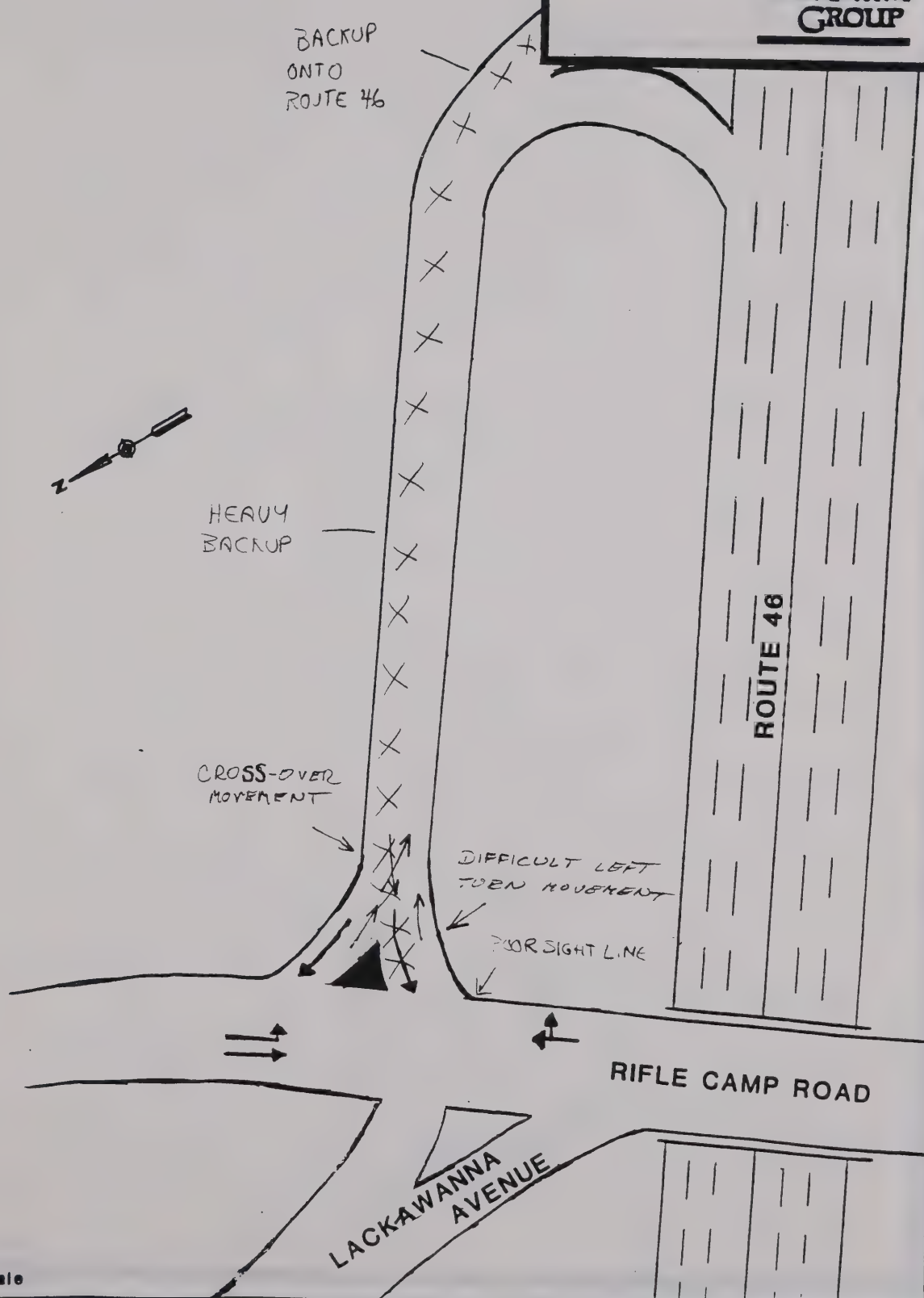
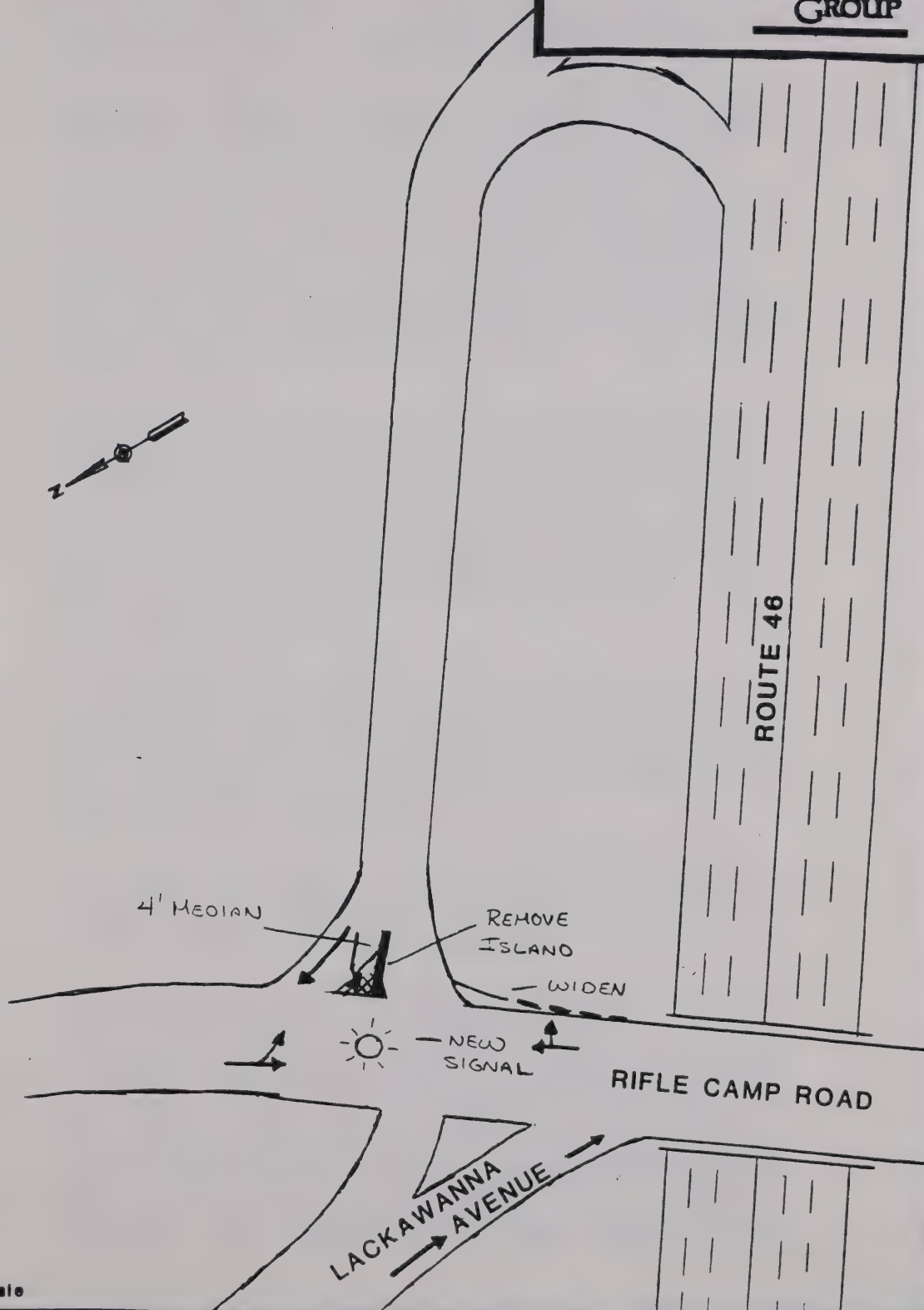


FIGURE
32

PROPOSED
SOLUTIONS



Schematic not to scale

This arterial section of US 46 is the most heavily traveled in the study area. In conjunction with the large amount of development adjacent to US 46, this section serves as a carrier of through traffic between NJ 23/I-80/US 46 and NJ 3 to the New York City area. The entire arterial has deficient levels-of-service in both directions during both AM and PM peak periods.

Previously studied improvements from the original study recommended a major widening and reconstruction from the US 46/NJ 3 interchange to the US 46/NJ 23/I-80 interchange. This included 1) from US 46/NJ 3 to Browertown Road, widen to provide two express lanes and two local access travel lanes, barrier separated, in each direction and 2) from Browertown Road to US 46/NJ 23/I-80 interchange, widen to provide two express lanes, two local limited access lanes and two frontage road, or common drive combinations, barrier separated, in each direction.

Some of the benefits that would result from this are that the amount of weaving and merging between local and through movements would be reduced. In addition, it would increase the average travel speed. It may also indirectly encourage passenger transit usage of express buses. One of the drawbacks is that an accident may cause a complete blockage of the lanes and leave no options to motorists to enter the other lanes and bypass the accident.

This widening will require reconstruction of US 46 interchanges with Riverview, Union, McBride, Lower Notch, Notch, Rifle Camp, Clove, Valley roads and NJ 3. With properly acquisition and required cutting/grading. This improvement was estimated to cost between \$100,000,000 to \$130,000,000 in 1987.

This section is deficient because capacity is constrained by the numerous access points, the highest ADT volumes in the entire study area and it is also constrained by the US 46/NJ 3 interchange.

The solution for mainline US 46 is not just to add-a-lane in each direction for through movement. There is a "loss" of the right most lane for through travel due to the many ingress/egress points located along US 46. The loss is evident in the reduction of the right lane capacity from approximately 1,600 vehicles per hour per lane to about 1,250. An access study should be undertaken on US 46 for the area between Riverview Drive and Union Boulevard and between McBride Avenue and Browertown Road. The objective of the access study should be

to limit the number of ingress/ egress points along US 46. It should include an inventory of adjacent land use and planned land use. Turning movement counts at all the access points should be taken for existing conditions and combined with trip generation needs with regards to growth. These turning movements and trip generation needs should relate to the physical geography to see what access points can be shared and which points require independent access. These options should be evaluated. These two areas experienced accident problems along U.S. 46. Most of the accidents occurred from weaving/merging vehicles that were entering/exiting driveways.

A collector-distributor (CD) roadway was also investigated for the area between the McBride and Browertown or Lower Notch interchanges. The difference between an access study and a CD roadway is that the access study would be done to reduce the number of driveways. The CD roadway would divert this turning traffic from the mainline at a selected point at the beginning of a group of businesses/shops in an area and then re-enter the mainline at the end of the CD roadway. Despite some of the physical constraints are involved, such as the Passaic River, Peckman's Brook and its tributaries, Morris Canal, a brook of Pearl Brook and the cut work involved, the CD roadway has several more shortcomings.

- 1) By shutting off direct access to and from existing business along US 46, drivers who don't know where certain stores are may not know to enter the CD roadway ahead of time. These vehicles would have to bypass the location and backtrack, essentially making a full circle. Therefore, proper signing would have to be incorporated.
- 2) If the CD roadway was built, for example, between the McBride and Lower Notch interchanges, drivers may be apt to bypass the congested mainline traffic by using the CD roadway, thereby creating congestion and blocking the CD roadway for its real intent. If the CD roadway is shortened to include the area between Browertown and Lower Notch or Rifle Camp/Notch Road Interchanges, it could work. The inhibiting factors will be the Morris Canal and the cut work required to add the CD system.
- 3) The CD roadway requires at least 34 additional feet of R-O-W if a jersey barrier is used. (Jersey barrier -2'; 2 shoulders, 5' each; 1 - 12' lane; and 10' of additional R-O-W off of the

outside shoulder). If a raised grass median were used, the footage requirements change from the 2' for the jersey barrier to 10' for the grass median.

5. Area 5 - US 46/NJ 3 Interchange

The area of the US 46/NJ 3 interchange is characterized by a merge of heavy traffic volumes from the New York City area with large volumes on US 46. There are numerous ramps that provide too many options for certain movements on and off of Valley Road. Several of these ramps also have a dual function as a direct residential access road to homes located immediately near the highway.

The US 46/NJ 3 interchange area includes traffic volumes from US 46, NJ 3 and Valley Road. The ADT volumes on US 46 west of the interchange are currently 120,100 vpd and 57,700 vpd on the east side. NJ 3 two-way ADT is 103,000 vpd. Valley Road traffic volumes are 28,100 vpd on the north side and 20,500 on the south side. Approximately 65 percent of the Valley Road traffic volumes are through movements that stay on Valley Road, and 35 percent of the cross-street traffic interchanges with US 46 or NJ 3.

The US 46/NJ 3 interchange area has predicted increases from 120,100 vpd to 127,800 vpd on US 46 west of the interchange, an increase from 57,700 vpd to 62,300 vpd on US 46 east of the interchange and; on NJ 3 east of the interchange an increase from 103,000 vpd to 112,400 vpd. Valley Road traffic volume increases are minimal. They are predicted to be 28,700 vpd on the north side and 20,900 vpd on the south side.

Slow speeds occur during the peak hours on the US 46 and NJ 3 mainlines. The ramp termini with Valley Road are also level-of-service deficient. The primary deficiency is at the US 46/NJ 3 WB merge. There is also a secondary deficiency at the US 46/NJ 3 EB diverge. The Valley Road interchanges have left-turn LOS deficiencies and U-turn movement LOS deficiencies of "E" at both US 46/NJ 3 on/off ramp termini in the 1996 AM and PM scenarios. This area of U.S. 46/NJ 3 had a problem with accidents. Many of the accidents occurred from weaving/merging difficulties. They mostly involved other vehicles or fixed objects such as a medium or guard rail.

At the US 46/NJ 3 interchange, the major movement to and from NJ 3 is not properly served because there are only two through lanes to NJ 3 from US 46 when there is

a need for three through lanes. The two through lanes in each direction have an estimated hourly capacity of 3,420 vehicles, or 1,710 vehicles per lane. (Capacity is based on several factors as established in the Highway Capacity Manual, 1985). Volume data from 1987 and projected to 1989 show the peak hourly volumes to and from US 46/NJ 3 to be 3,918 (AM eastbound) 4,184 (AM westbound), 3,990 (PM eastbound), 3,997 (PM westbound). These volumes are predicted to increase for 1996 to 4,204 (AM eastbound, 4,490 (AM westbound), 4,282 (PM eastbound) and 4,270 (PM westbound). A third through lane will increase the capacity to a minimum of 5,130 vehicles in each direction. The interchange redesign will also increase the lane capacity even more by improving roadside obstructions, lateral clearance restrictions, etc. Capacity at the Valley Road ramp terminus is constrained by left-turns, U-turns and merge and diverge movements.

There are too many options for motorists entering or exiting US 46 or NJ 3 WB. Notch Road has access directly onto a US 46 WB on-ramp and Oak Hill Road has access onto a US 46 EB off-ramp. Both these roads serve residential land uses. Other deficiencies include a non-typical configuration U-turn/left turn that is absent of signing at the north side of Valley Road intersection.

There is minimal signing for EB vehicles who want to use NJ 3, which diverges to the right onto two travel lanes. Currently, the left and middle lanes of US 46 are designated as US 46 through lanes and the right lane is designated as NJ 3. The middle lane actually serves a dual purpose for access to both US 46 and NJ 3. This interchange was originally designed with U.S. 46 through movements being the primary movement and NJ 3 was a secondary movement. However, the primary travel movement is now from U.S. 46 EB to NJ 3 EB and from NJ 3 WB to U.S. 46 WB. All the signing for this interchange in the eastbound direction is located on the Rifle Camp Road overpass. This overpass is approximately 4000 feet before the US 46/NJ 3 interchange and is the only location of signs for this interchange except for those immediately at the diverge. These signs are not visible to vehicles entering from the Rifle Camp/Notch Road and Clove Road interchanges.

Land use constraints include commercial and residential development near the area and close proximity to other interchanges that can hinder any proposed "up-to-spec" improvements. Another constraint includes the structure over Valley Road and the US 46 EB overpass over NJ 3 WB traffic.

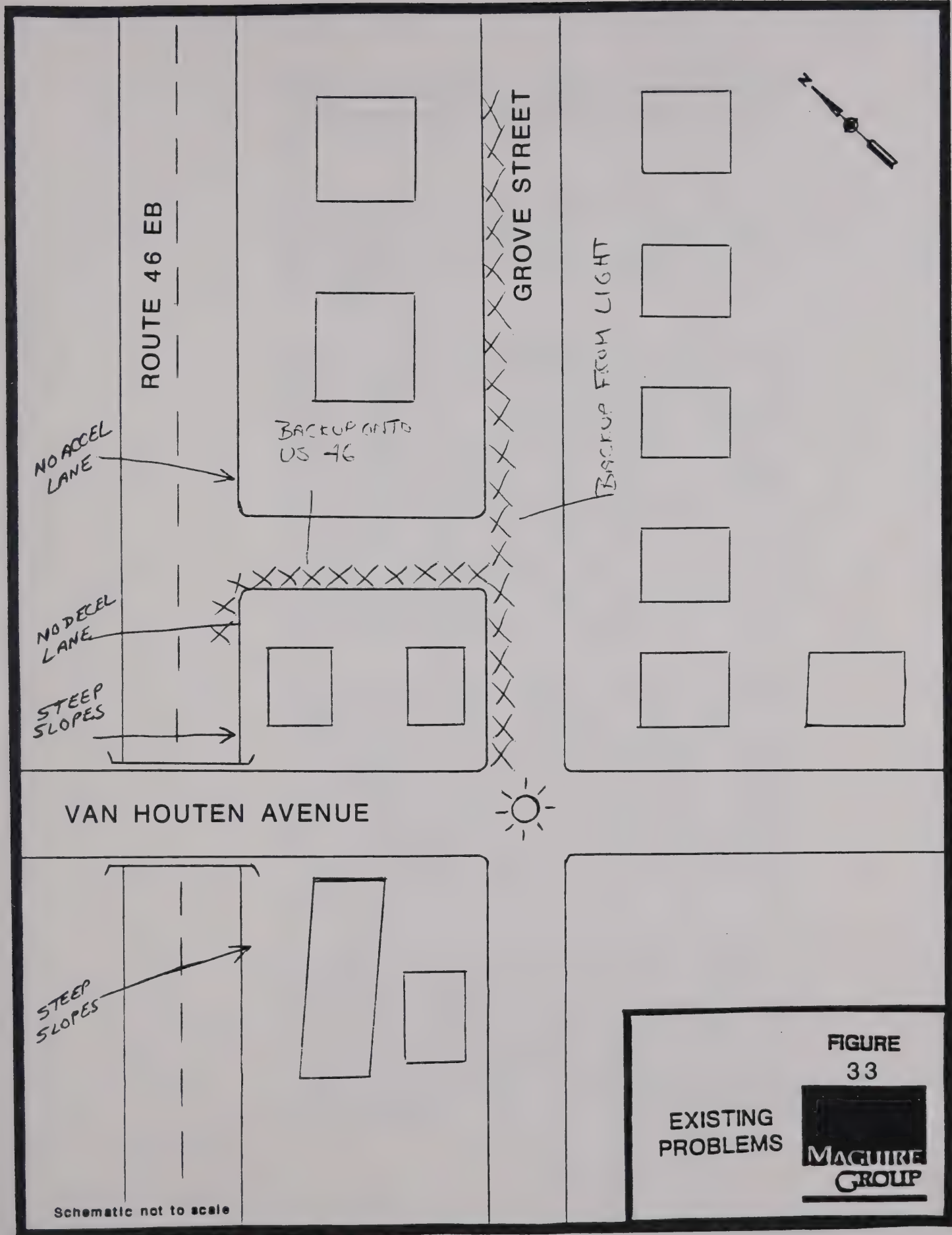
This interchange, including the Valley Road interchange is in the redesign concept stage. It is a high priority need in this study corridor. Estimated reconstruction cost for this interchange were estimated anywhere between \$5,000,000 to \$15,000,000 in 1987.

6. Area 6 - a) US 46 Between NJ 3 and the Garden State Parkway and, b) NJ 3 Between US 46 and the Garden State Parkway

- a) The US 46 section of this area is characterized similarly to area 4 but with less dense commercial development and lower traffic volumes. There are grade-separated interchanges at Van Houten/Grove and the Garden State Parkway. It comprises 4 travel lanes with shoulder. The NJ 3 section of this area comprises 6 travel lanes (4 at approach to US 46) but is a limited access highway. There are grade-separated interchanges at Grove Street and the Garden State Parkway.

US 46 at Van Houten Avenue/Grove Street Interchange - Current ADT volumes on US 46 carry 57,700 vpd. Van Houten Avenue carries 11,700 vpd north of the interchange and 15,200 vpd south of the interchange. Estimated 1996 ADT volumes on US 46 are 62,300 vpd. Van Houten estimated volumes are 11,900 north of the interchange and 15,500 south of the interchange. The US 46 eastbound on-off ramps with Grove Street have a storage deficiency from lack of a deceleration lane. It is also in close proximity to the Van Houten/Grove Street intersection, which queues back across the ramp termini with Grove Street. (See Figure 33.) The eastbound on-off ramp provides an acceptable traffic level-of-service. However, the ramp is quite short in length and does not permit adequate storage for waiting vehicles. This problem can be improved by installing a sensor in the off-ramp to manipulate the signal phasing/timing at the nearby Van Houten/Grove intersection. When there is a considerable queue, then the sensor activation will help stop the Grove Street vehicles so that the ramp vehicles can make the turns off. A deceleration lane was looked at for this problem, but the bridge abutment location was the constraining factor.

The US 46 westbound on-off ramps with Van Houten Avenue is predicted to provide satisfactory traffic operations during both the AM and PM peak hours. Therefore, no improvements are necessary



at this intersection. However, the construction of acceleration and deceleration lanes on Route 46 would permit easier movements to and from this ramp for westbound traffic (see Figures 34 and 35).

The arterial section is not deficient except for the westbound direction near the US 46/NJ 3 interchange. This deficiency is caused by the merge required with the NJ 3 westbound traffic. No recommendations are needed for this area at this time.

- b) NJ 3 at Grove Street Interchange - Current ADT volumes on NJ 3 are 103,000 west of the interchange and 124,400 east of the interchange. Grove Street volumes are 14,500 north of the interchange and 15,900 south of the interchange. Estimated 1996 volumes on NJ 3 are 112,400 west of the interchange and 135,300 east of the interchange. Estimated Grove Street ADT volumes are 14,800 north of the interchange and 16,200 south of the interchange. The NJ 3 on-off ramps with Grove Street are steep and vehicles experience traction problems (See Figure 36). There is also a difficult left-turn movement onto Grove Street, triangle island at the end of the ramp and no acceleration/deceleration lanes on NJ 3.

The eastbound on-off ramps at NJ 3 and Grove Street provide a satisfactory LOS and, therefore, improvements are not necessary. The westbound on-off ramps with Grove Street currently have a level-of-service of "F" at this intersection and is predicted to be "F" in 1996. A traffic signal along with the geometric improvement of removing the triangle island is recommended (See Figure 37). In addition, the construction of acceleration/deceleration lanes on Route 3 westbound will permit easier vehicle improvements to and from Route 3.

The arterial section of NJ 3 is deficient due to the loss of a through lane at the US 46/NJ 3 interchange and from the large traffic volumes on the limited access facility. The addition of travel lanes will do nothing to help traffic flow if there is no improvement to the US 46/NJ 3 interchange. Therefore, there should be three travel lanes, the same number recommended through the interchange.



VAN HOUTEN AVENUE

ROUTE 46 WB

NO DECEL LANE

NO ACCEL
LANE

Schematic not to scale

FIGURE
34

EXISTING
PROBLEMS



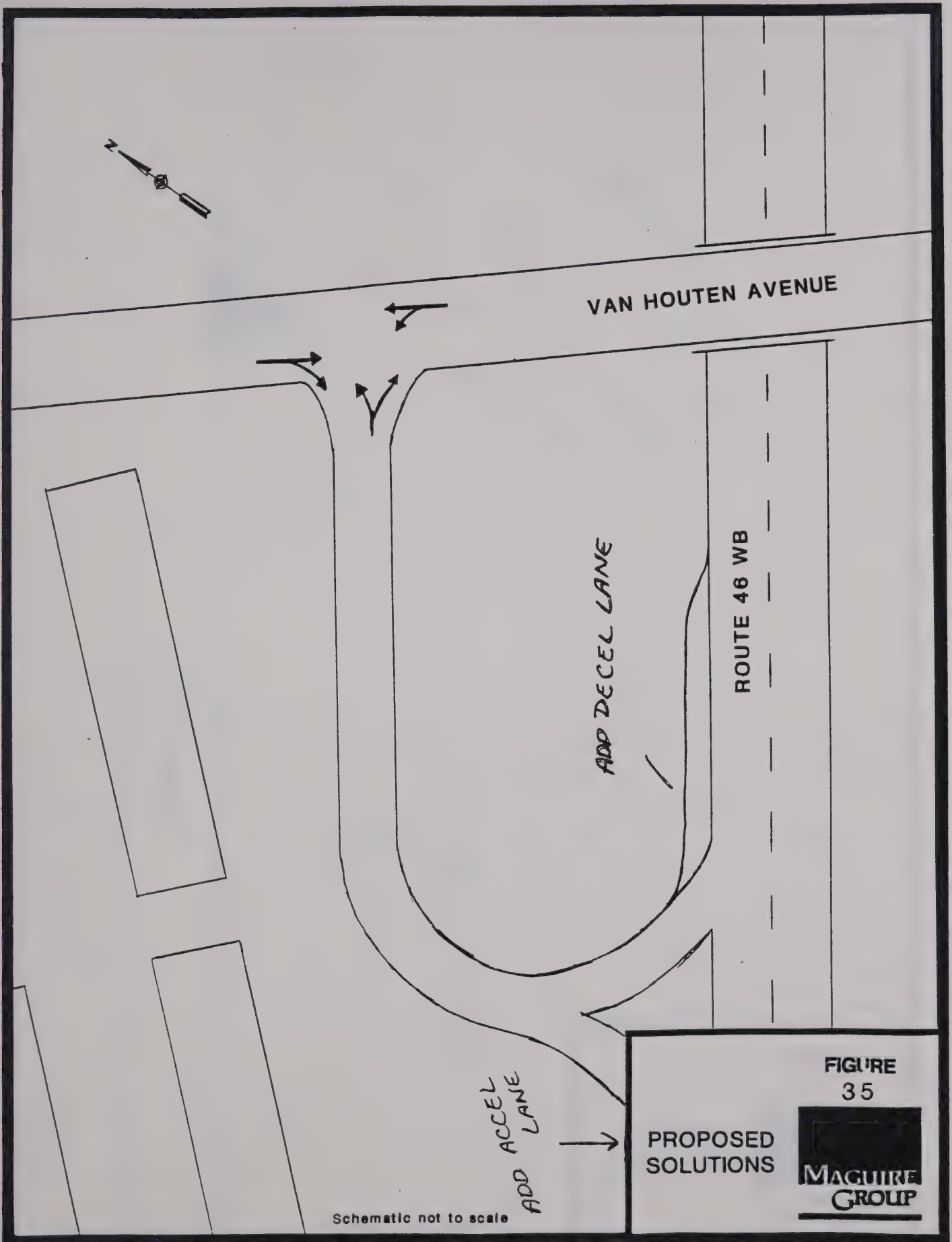


FIGURE
35

PROPOSED
SOLUTIONS



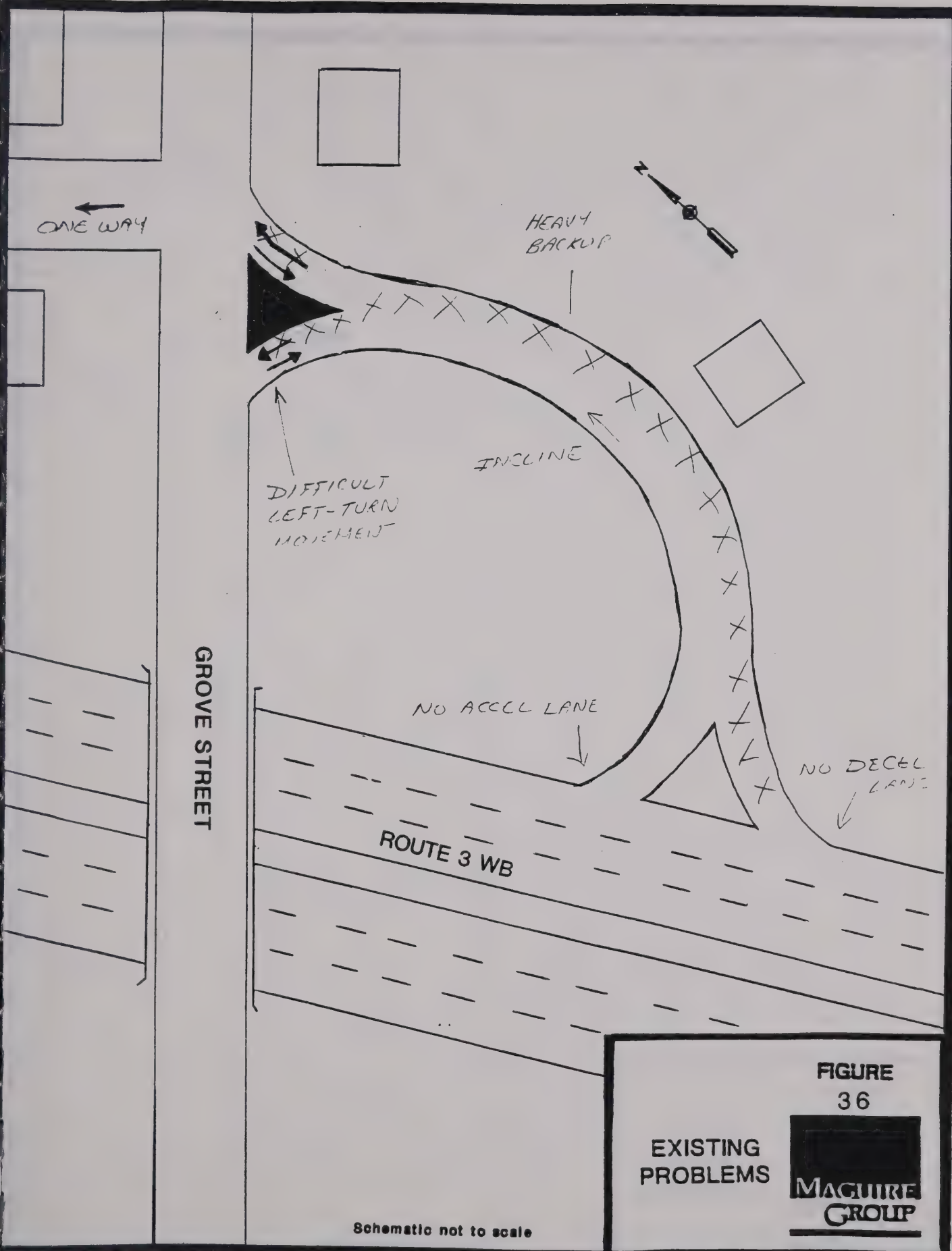
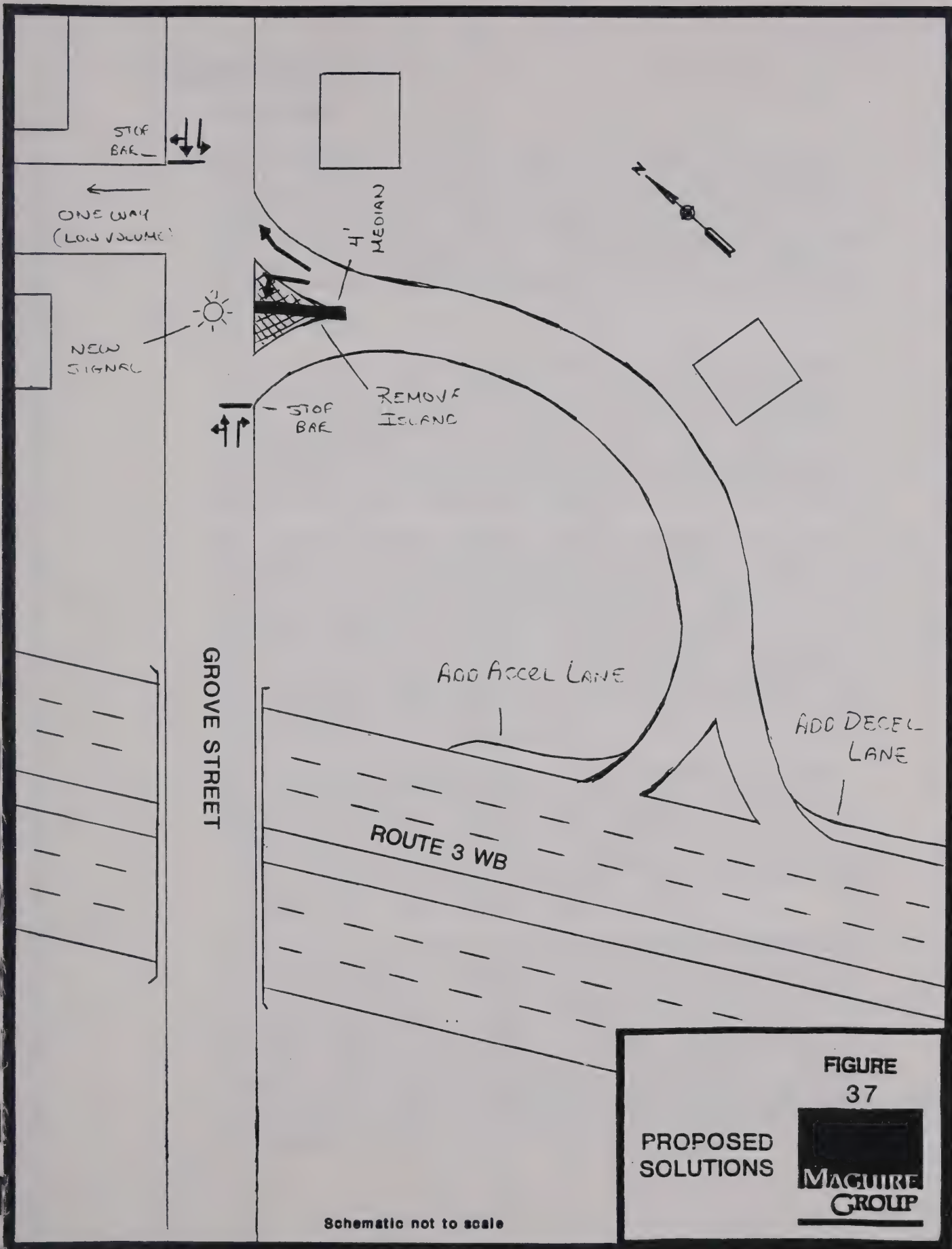


FIGURE
36

EXISTING
PROBLEMS





Schematic not to scale

FIGURE
37

PROPOSED
SOLUTIONS



III. RECOMMENDATIONS

A. INTRODUCTION

The recommendations are divided into three categories; first, second or third priority based on the identified problem areas relative importance to improving the overall system performance. The proposed recommendations are grouped into the above categories and presented with reasons why they are so categorized. Figure 38 shows the locations of the proposed recommendations and their relative priority.

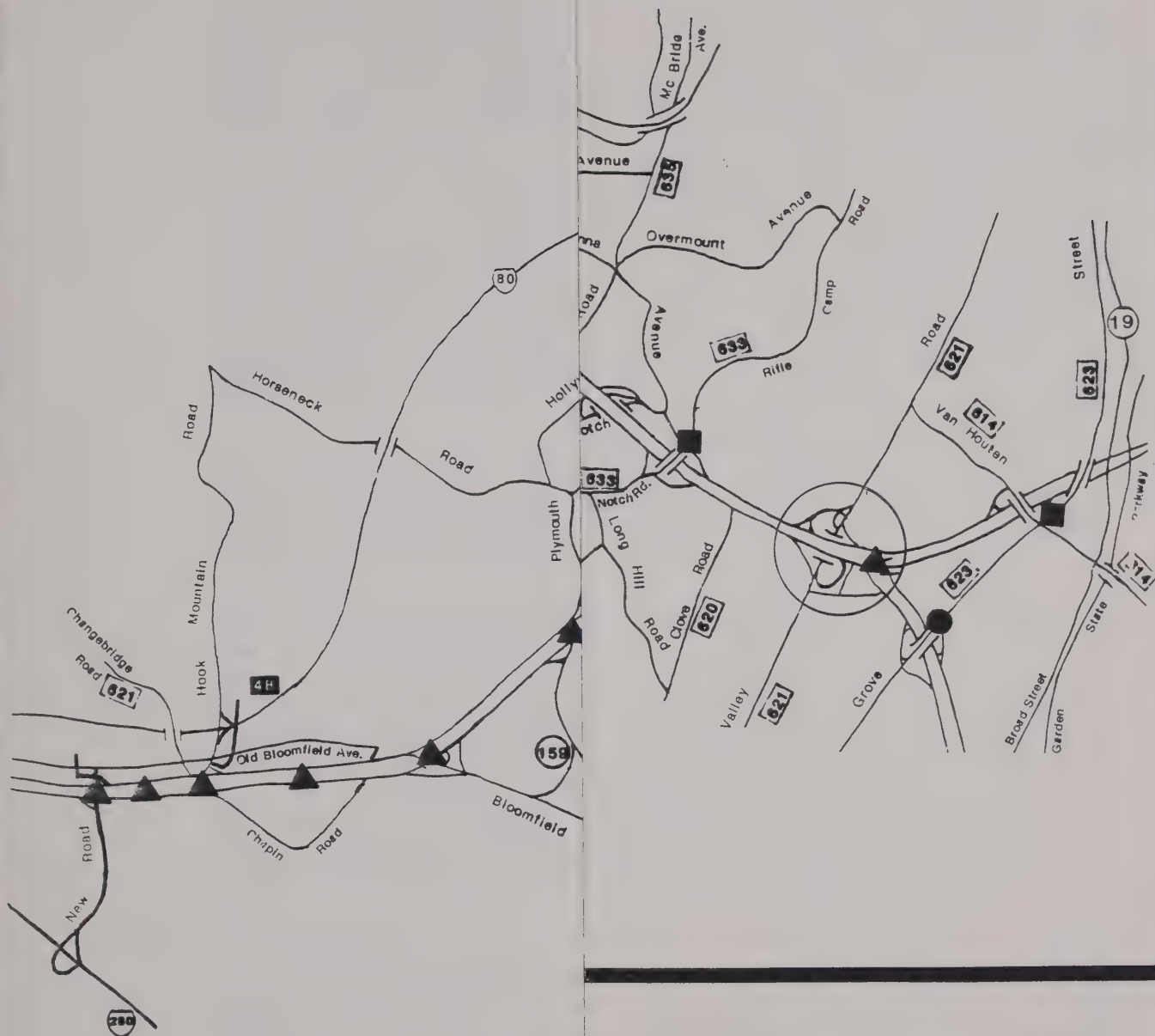
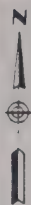
B. FIRST PRIORITY





There is a need for improving the signing in the study area. This should include replacing or adding to the existing signs. This will serve to not only identify areas where signing improvements are needed, but to also avail the findings for site-specific improvements. For example, the advance signing for the US 46/NJ23/I-80 interchange should be improved. Lighting, where needed, should be implemented.




The US 46/New Road intersection is recommended for reconstruction with a reverse jug-handle, a reverse loop, a closing of the current WB to SB jug-handle and a closing of vehicle access from Old Bloomfield Avenue. Access to Old Bloomfield should remain as it currently exists. This proposal is needed to improve flow through the intersection by reducing the number of vehicles accessing this intersection (from Old Bloomfield Avenue), by eliminating one signal phase and by eliminating the existing intersection of New Road and the WB to SB jug-handle.

The proposed improvement for the Hook Mountain Road interchange as shown in the NJDOT design study (and Figure 9) should be implemented together with the New Road interchange improvement. The only change to the NJDOT design study is to add a left turn lane in the SB approach to U.S. 46. This can be accomplished without any extra land acquisition from the dual U-turn lanes that currently exist.

The addition of a third through lane between New Road and Bloomfield Avenue is recommended during the reconstruction of the New Road and Hook Mountain Road interchanges. These proposed improvements are recommended to be constructed at the same time to promote ease of traffic operations throughout this area. The third lane should be added in the EB approach to the New Road interchange and dropped at Bloomfield Avenue. In the WB direction, the lane should be added at Bloomfield Avenue and dropped at the reverse jug-handle at New Road.



-  Interstate
-  U.S. Route
-  State Highway
-  County Road

-  FIRST P
-  SECOND
-  THIRD P

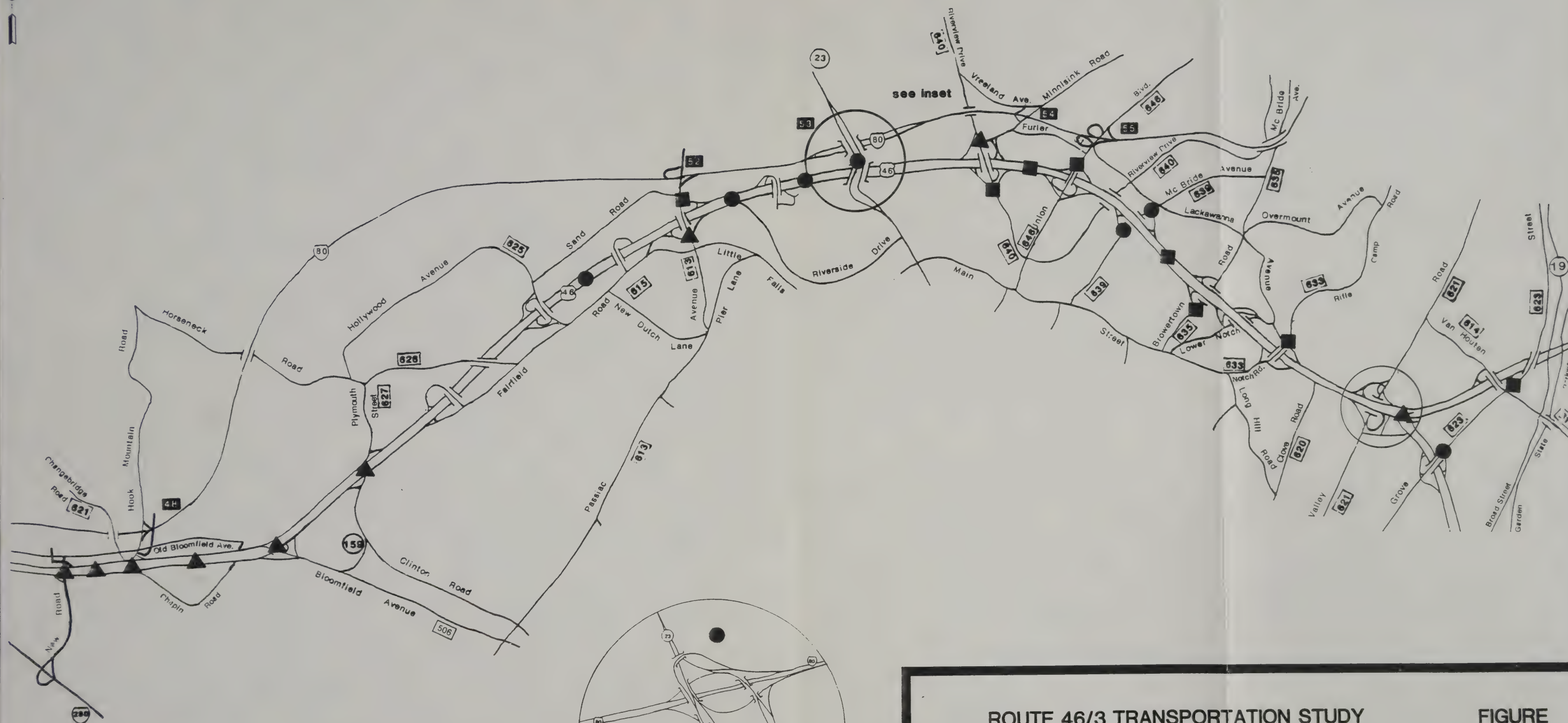
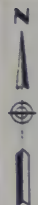
ATION STUDY

FIGURE

38

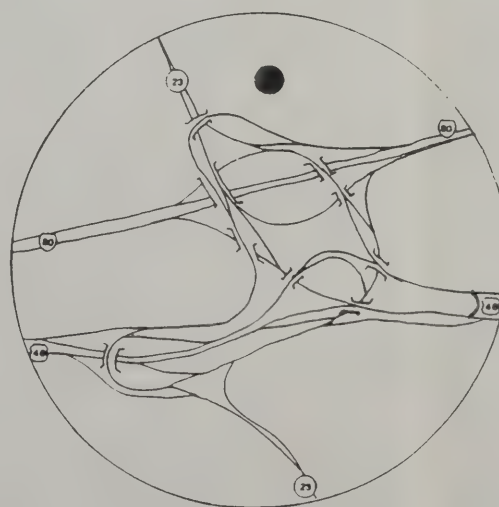
MMENDATIONS

MAGUIRE
GROUP



- Interstate
- U.S. Route
- State Highway
- County Road

- FIRST PRIORITY
- SECOND PRIORITY
- THIRD PRIORITY



Schematic not to Scale

ROUTE 46/3 TRANSPORTATION STUDY

PROPOSED RECOMMENDATIONS

FIGURE
38



A similar scenario to that at the New Road and Hook Mountain Road exists at the US 46 intersection with Clinton/Plymouth Streets. Traffic flow is congested by the numerous movements at this intersection. It is proposed that this intersection, by virtue of the NB and SB approach angles, be separated into two at-grade intersections with US 46. The proposed intersections should ideally be located at least 1200 feet apart with signal phasings and timings coordinated between each other, especially if a shorter spacing distance is necessary. This proposal will improve traffic flow on the mainline and on the cross-streets.

At the Passaic Avenue/Two Bridges Road interchange with US 46 EB ramp, it is recommended that a loop ramp and finger ramp be constructed in the southeast quadrant to facilitate EB to NB and NB to EB movement. This is recommended to reduce the queue lengths on the US 46 EB off-ramp at this interchange. It will also eliminate the left-turns to the north across two southbound lanes of traffic. The southbound lanes of traffic have long queues from the Passaic Avenue/Fairfield Avenue intersection.

The design study for the Riverview Drive/Minnisink Road interchange with US 46 should be implemented to relieve the area of its deficiencies, including the deficiency that causes a queue of vehicles to back up onto US 46 eastbound. (Please refer to Figure 23).

The greatest constraint to mainline traffic flow occurs at the US 46/NJ 3 interchange. The most immediate need in the study area is the provision for a third through lane between US 46 and NJ 3. This addition will help relieve traffic congestion that occurs on US 46 EB and NJ 3 WB. The number of off-ramp movement options from US 46 and NJ 3 has to be limited. Residential traffic should also be removed from the ramp traffic. Also, consideration should be provided for the most significant turn movement, US 46 or NJ 3 WB to Valley Road SB and vice-versa.

C. SECOND PRIORITY

Two access studies are proposed to help control ingress/egress along US 46. The first is between the Riverview Drive and Union Boulevard interchanges, mile posts 57.1 to 57.5 and the second is between McBride Avenue and Browertown Road interchanges, mile posts 58.1 to 58.6.

The objective of the access study should be to limit the number of ingress/egress points along US 46. It should include an inventory of adjacent land use and planned land use. Turning movement counts at all the access points should be taken for existing conditions and combined with

trip generation needs with regards to growth. These turning movements and trip generation needs should relate to the physical geography to see what access points can be shared and which points require independent access. These options should be evaluated and recommendations made.

The following intersections are recommended for signalization:

- . US 46 EB on-off ramps with Riverview Drive
- . US 46 WB on-off ramps with Union Boulevard
- . US 46 EB on-off ramps with Browertown Road
- . US 46 WB on-off ramps with Rifle Camp/Notch/Lackawanna Avenue.

The above intersections all had deficient left-turn movements from the ramps to the cross-streets. The signalization of these intersections would eliminate the "critical gap" deficiency which exists for the left-turn. (Critical gap" refers to the capability of vehicles to get an open space or gap in order to make turns).

The WB ramp at Two Bridge Road needs to be restriped to two lanes and the deceleration lane needs to be widened to accommodate the queue. The ramp may need to be widened if it is not up to specifications.

The US 46 EB off-ramp to Grove Street has queues that back onto US 46. In lieu of reconstructing the bridge to add a deceleration lane, a sensor should be placed in the off-ramp to detect when the ramp is near or over capacity. This would then instruct the signal at Grove Street and Van Houten Avenue accordingly to move traffic on Grove Street so the ramp traffic can exit US 46. This will also involve a signal that prevents Grove Street traffic from continually blocking the off-ramp traffic.

D. THIRD PRIORITY

The most desirable improvements would be to reconstruct various movements in the US 46/NJ 23/I-80 interchange as movements independent of other movements.

This includes:

- . NJ 23 SB to I-80 WB
- . I-80 EB to NJ 23 NB
- . I-80 EB to US 46 EB
- . US 46 WB to NJ 23 NB
- . US 46 WB to I-80 WB
- . US 46 WB & EB Through
- . NJ 23 NB & SB Through

This interchange area should be an independent study and should provide for the most exclusive facilitation possible for the above-mentioned movements. A reconstruction of the area movements will serve to increase traffic flow and speed and decrease the congestion that has a domino effect in all directions.

There will also be a need in the future for a third through lane between Hollywood Avenue and the US 46/NJ 23/I-80 interchange for capacity reasons. In the westbound direction, the termination of the third travel lane at Hollywood Avenue is acceptable for level-of-service because the ADT volumes on US 46 decrease west of the interchange. In the eastbound direction, it is recommended that the third travel lane be continuous on US 46 through the US 46/NJ 23/I-80 interchange for the similar continuity reasons mentioned throughout this report.

The NJ 3 WB on-off ramp with Grove Street is recommended for signalization in order to eliminate the critical gap deficiencies for left-turn movements from the minor street to the major street.

The on-off ramps with U.S. 46 and McBride Avenue are currently under design and provide efficient operation.

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